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OCULAR DISEASE AND FOCAL SEPSIS*

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In certain cases it is possible to cure or to alleviate ocular disease by finding and eliminating foci of sepsis. However, it would be untrue to say that improvement of the patient's condition may be similarly effected in all similar cases. It is proposed to give some account of conditions in which this method of investigation and treatment is of value.

It is also proposed to mention certain forms of ocular disease which are commonly associated with the definite presence of focal sepsis, but in which a cure cannot be expected by elimination of the focus.

When the ophthalmic surgeon finds that ocular disease that may be attributable to focal sepsis is present, he must take steps to determine the matter by some preliminary investigation. After this he may place the facts before the patient's usual medical advisor for the necessary action, or in certain cases he may advise the patient directly as to the special investigation required.

OCULAR DISEASES THAT MAY BE CURED OR IMPROVED BY ELIMINATION OF A FOCUS OF SEPSIS

Ocular diseases that may be cured or improved by the elimination of a focus of sepsis are: increased lacrimation, blepharitis, tarsal cysts, chronic conjunctivitis, phlyctenular conjunctivitis, episcleritis, corneal ulcer, dendritic ulcer of the cornea, dacryocystitis, iritis and cyclitis.

Lacrimation.—When increased beyond the normal, lacrimation is often an annoying symptom in persons of middle age. It may occur when no change can be observed in the anatomic position of the lower punctum lacrimale. When the symptom is observed to be associated with dental sepsis, especially with broken and decayed teeth, the clearing up of the sepsis usually abolishes the increased lacrimation. A woman, aged 32, consulted me recently because her eyes were always watering. On examination under cycloplegia she was found to be emmetropic, with no ocular change except a slight hyperemia at the macula. She told me that her only remaining teeth were the lower central and lateral incisors, and that her dentures were comfortable. I asked her to remove the dentures. A small septic stump was visible

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under the denture of the upper jaw. This was evidently the cause of the condition, as after removal of the stump the lacrimation ceased without ophthalmic treatment.

Blepharitis.—In children, blepharitis is usually associated with enlarged and septic tonsils. When the tonsils have been enucleated, the blepharitis disappears. When these patients are treated by lotions and ointments and perhaps glasses are ordered, it is the experience of every ophthalmic surgeon that they improve, but the improvement is usually not permanent, as a relapse occurs and after a time they come to the hospital for treatment again. On the other hand, in the cases in which septic tonsils are enucleated, there is often a permanent cure.

Blepharitis in adults is occasionally due to dental sepsis. One of the most grateful patients I ever had was a young married woman with a severe case of blepharitis and a distressingly poor complexion. She had glasses for occasional use which had been prescribed by an ophthalmic surgeon and which were practically correct. After dilation of the pupil, fine dusty clouds were seen in the vitreous by slit-lamp illumination and opaque fibrils microscopically. There was slight hyperemia at the macular regions of both eyes. Dental roentgenograms were obtained which indicated the probable presence of apical abscesses in upper left 4, and lower left 5, both of which had filled roots. The patient was advised to see her usual dental surgeon and to submit the roentgenograms for his opinion. The dentist immediately removed these two teeth, and subsequently on his own initiative another dead tooth. When I saw the patient a few months later the blepharitis had disappeared and she had a natural complexion without any of the blemishes that had previously spoilt her appearance.

Tarsal Cysts.—These are almost invariably associated with dental sepsis in adults and with septic tonsils in children. The cyst should be dealt with surgically, and the necessary investigations carried out to determine if a septic focus is present. If present, it should be got rid of as soon as possible. The method that I use in dealing with tarsal cysts is:

> The conjunctiva of both eyes is anesthetized by the instillation of a solution of 4 per cent cocaine hydrochloride. The tissue around the cyst is infiltrated with an isotonic solution of procaine hydrochloride 1 per cent, and epinephrine chloride 1:10,000. After ten minutes, the cyst is included between the blades of Traquair's cyst forceps, and an incision is made into it with a small scalpel. The whole of the posterior wall of the cyst is cut away with scissors and fixation forceps. If necessary, the interior of the cyst is cleared out with a tiny curet, and touched with absorbent cotton that has been moistened with pure phenol and wound on the end of a glass rod; immediately afterward, some saline solution is instilled into the area.

By this method there is no recurrence of the cyst, as frequently happens when a cyst is merely incised; also, the operation is painless.

As I have had this operation for a tarsal cyst performed on myself by an inexperienced house surgeon, I am assured of the painlessness of the procedure.

I recognize no connection between tarsal cysts and errors of refraction, though they frequently coexist.

Conjunctivitis.—Conjunctivitis of several chronic varieties, including so-called angular conjuctivitis, is frequently caused by dental sepsis and subsides when the sepsis is eliminated, while drops of normal or slightly hypertonic saline solution are instilled into the conjunctival sac every two hours. It seems to be a matter of indifference what the bacterial organism happens to be. According to the books, angular conjunctivitis is caused by the Morax-Axenfeld bacillus and is cured by the instillation of a solution of a zinc salt. In my experience the condition is improved much more quickly by hypertonic saline drops, but is not cured until the cause, that is, the dental sepsis, is removed.

Episcleritis.—Episcleritis, or subconjunctivitis (episcleritis partialis fugax), is almost invariably associated with dental or tonsillar sepsis. If the ocular condition is observed at an early stage and the focal sepsis is adequately dealt with, a cure is effected. If, however, the condition is neglected, an incurable nodular episcleritis may develop. Here again, the best local treatment is by instillations of slightly hypertonic saline solution.

Phlyctenular Conjunctivitis.—In children this condition is usually associated with enlarged and diseased tonsils. When the tonsils have been dealt with surgically, that is, by enucleation and not by tonsillotomy, and when a period has elapsed, during which the child is kept at a convalescent home in order to recover from the toxemic condition produced by the septic tonsils, the phlyctenular conjunctivitis subsides. Phlyctenular keratitis, though much less amenable, requires the same treatment.

Corneal Ulcer.—Ulceration of the cornea, including pneumococcal ulcer, is greatly influenced by the presence of oral sepsis. The commonest form of ulcer seen in the hospital out-patient department is found in the laborer of middle age who has had some trivial injury at his work a week before coming under observation. Examination of the mouth in almost every case shows the obvious presence of some form of open dental sepsis from which there is a constant flow of pyogenic organisms to the conjunctival sac. Also in these cases there is a great deal of absorption of toxic material by the lymphatics of the mouth, and after deglutition by the lymphatics of the intestine. This absorption renders the cells of the conjunctiva and cornea less able to deal phagocytically with the ordinary flora of the conjunctival sac. These organisms flour-

ish on, in and between the superficial cells of the conjunctiva and cause erosion of the corneal tissue, which has been denuded of its epithelium at the seat of injury. For such a patient, skilled dental treatment should be obtained at once or within twenty-four hours if the ulceration is to be checked and the local treatment is to be effective. Merely to advise such a patient to seek dental aid, either privately or at a hospital, without making immediate and adequate arrangements for it, is insufficient. At the two hospitals (Westminster Hospital, Broad Sanctuary, and Royal Eye Hospital, Southwark) where I carry on ophthalmic clinics I can be sure that skilled dental advice will be given either the same day or the next day, and that the dental treatment, whether it is merely the removal of tartar and general cleansing or whether it entails the extraction of one or more broken and septic teeth, will be carried out forthwith. It is this great advantage which I have had, to be able to obtain the opinion of a skilled dental surgeon immediately, that has given me the experience on which this paper is based.

Dendritic ulcer is peculiarly associated with dental sepsis, and in my experience is as often met with in private practice as in hospital work.

In all these cases of corneal ulceration the local treatment is to put the eye at rest by keeping the pupil moderately dilated by atropine and to flush the conjunctival sac every two hours or oftener with 2 per cent solution of sodium chloride. When there is a rapidly advancing ulcer or one with overhanging edges, additional treatment may consist of some form of cauterization.

Iritis.—This disease may result from dental sepsis, tonsillitis or other forms of focal sepsis, such as prostatic inflammation. Even the oral sepsis resulting from the deposition of tartar on the teeth may be a cause. Recently I saw a man at the Royal Eye Hospital who had an attack of iritis in the left eye. Detailed clinical and pathologic investigation disclosed no local or general condition to account for the inflammation. On the chance of there being some dental complication that I did not have sufficient knowledge to detect, I sent him to see Dr. Livingstone of King's College Hospital dental department, who found oral sepsis present due to deposition of tartar. The patient's teeth were thoroughly scaled, and within a week the inflammation of the iris had subsided. However, it is usually the more severe forms of focal sepsis that cause iritis.

Cyclitis.—This is well known to be, in some cases, the result of focal sepsis. It is of the greatest importance to find and eliminate the focus as early as possible, as when the disease has taken a firm hold

of the eye, owing to the constant and long-continued action of the toxins, it is difficult or impossible to eradicate. In these cases there may be more than one focus at work.

Two cases of cyclitis which interested me are as follows:

CASE 1.—A young woman whom I examined recently had injured one eye while playing golf. In getting out of a sand bunker she had struck a stone with her niblick and her eye had been filled with sand. At the time it was considered possible that a foreign particle might have penetrated the globe. When I saw her there was well marked cyclitis, with circumcorneal redness, keratitis punctata, a considerable amount of cloudy opacity in the vitreous and a misty view of the fundus, though the vision was still full normal. As a matter of precaution the eyeball was examined roentgenologically and it was shown that no foreign body opaque to roentgen rays was present. The patient told me that she had had pain over the site of an unerupted wisdom tooth, and had had the gum lanced. I then had dental roentgenograms taken, which showed the four wisdom teeth to be unerupted, impacted and septic. On examination by a dental surgeon, it was found that pus welled from the gum near one of these teeth. The four impacted teeth were removed by the dental surgeon under general anesthesia. On the fourth day the ciliary flush had disappeared and the keratitis punctata was subsiding. She then returned to the country. Examination two months later revealed no recurrence.

This is the first case that I have seen of cyclitis due to oral sepsis resulting from impacted wisdom teeth.

The other case, which was less simple in that more than one focus of sepsis was present, was a case of iridocyclitis.

CASE 2.—A man, aged 37, showed ciliary injection, keratitis punctata and a muddy iris in one eye. Examination by a distinguished throat surgeon elicited the opinion that the tonsils were enlarged and septic and should be enucleated. Roentgen examination of the teeth showed that there was one tooth with an abscess at its apex, and one unerupted, impacted wisdom tooth. Clinical examination by a dental surgeon confirmed the roentgen observations, and the opinion was given that the impacted tooth was septic; also that there were two other dead teeth in the patient's mouth which it would be better to remove, in view of the ocular condition. The advice of a general consulting surgeon was to remove the three teeth mentioned and later to have the tonsils enucleated. However, the patient, a city merchant, pleaded the importance of his private affairs and merely consented to the removal of the abscessed tooth. This was carried out under local anesthesia, and a few days afterward the deposits on the back of the cornea decreased considerably; a week later they had diminished so much as to be only just visible; while after three weeks the condition had apparently cleared up.

It appears that while at least three different sources of sepsis were present in this case, the patient consented to the removal of only one focus, which was the easiest to deal with and happened to be the one that

was causative of the ocular disease. In this connection I shall state my opinion that when ocular disease exists, it is bad practice to use infiltration anesthesia for the removal of septic teeth.

OCULAR DISEASES THAT ARE NOT CURED BY ELIMINATION OF THE FOCUS OF SEPSIS

Among the ocular diseases with which it is usual to find marked focal sepsis associated are cataract, glaucoma, thrombosis of the central artery of the retina and thrombosis of the central vein or of one of its tributaries.

The frequent or constant association of certain forms of ocular disease with such common conditions as focal sepsis, past or present, does not necessarily prove cause and effect, but is suggestive.

Cataract.—This is the technical term for any opacity of the lens, however minute, and the acquired, nontraumatic variety alone is referred to here. The matter is gone into more fully elsewhere.[1]

In the *Transactions of the Ophthalmological Society of the United Kingdom* for 1928,[2] I published full clinical details of 100 consecutive cases of patients seen in private consultation in whom the visual acuity after correction of ametropia was full normal, 6/6 in each eye. During the period under survey, thirty-nine other patents were examined in whom the visual acuity after correction of the ametropia was lower than normal owing to obvious pathologic changes in the eye; these are excluded from the series, as I wished to consider only ordinary cases of refraction.

Twenty-five of these patients were found to show lenticular opacity by ordinary focal illumination, and by slit-lamp illumination an additional eleven patients exhibited microscopic opacity.

On investigation it was found that eight patients had apical abscesses of the teeth as shown by roentgen examination; two patients, one or more unerupted, impacted and septic teeth; three, definite pyorrhea; two, chronic disease of the appendix; one, a duodenal ulcer; two, buried fragments of teeth left in the jaws; one, residual sepsis of the jaws after extractions, and ten had dead teeth or were already undergoing dental extractions for this or a similar condition. That is to say, thirty of the thirty-five patients with lenticular opacities had serious focal sepsis in some part of the body, generally in the mouth.

The proportion of cases in which lenticular opacity was found was much higher in the thirty-nine cases mentioned in which the vision remained defective after correction.

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1. MacCallan, A. F.: Cataract, Westminster Hospital Reports **20**:63, 1929.

2. MacCallan, A. F.: On Focal Sepsis and the Eye, Tr. Ophth. Soc. U. Kingdom **48**:181, 1928.

OTHER OCULAR CONDITIONS FREQUENTLY ASSOCIATED WITH FOCAL SEPSIS [3]

Changes in the Vitreous.—These invariably accompany any long-continued focal sepsis. In the normal vitreous in children who are completely healthy and who have never suffered from tonsillar inflammation, slit-lamp examination reveals no opacity except vestigial filaments. When the position of the eye is changed, vestigial filaments, when present, can be seen to move in a swimming manner, showing that the vitreous is slightly fluid. In conditions of focal sepsis, slit-lamp examination reveals grayish clouds which alter their position as the eye is moved; on examination with the microscopic attachment they are seen to be composed of snowlike masses or lacelike curtains, or to have a trabeculated structure. The vitreous opacities that I have just described may be composed of cells that have exuded from the vessels of the ciliary body when there have been conditions of inflammation, but more usually they are probably the result of chemical changes due to the action of toxins on the vitreous substance.

Hyperemia at the Macula.—This condition has been noted in a number of cases in which definite focal sepsis existed.

Pigmentary Changes and Definite Degeneration of the Retina at the Macula.—These are frequent results of long-continued sepsis.

Choroiditis.—Circumscribed choroiditis, near the optic disk, perhaps at the macula, is associated in some cases with focal sepsis, when all other possible causes have been ruled out.

Progressive Myopia.—While no opinion is offered as to the cause of myopia, I may say that all cases of progressive myopia that I have seen during the last five years have been associated with focal sepsis of marked degree. This has been the experience of others. In children the focus is usually situated in the tonsils, and in adults in the mouth or the intestinal tract.

INFLUENCE OF FOCAL SEPSIS ON INTRA-OCULAR OPERATIONS

If an ophthalmic surgeon believes it possible for a definite focus of sepsis to influence unfavorably the result of his operation, he will take all reasonable steps to eliminate any obvious focus beforehand. When children have to be operated on for strabismus or cataract, an examination should be made beforehand to see that they are not suffering from enlarged and septic tonsils.

When it is decided to operate on a patient for a senile cataract the tonsils and teeth should be examined. The very fact of discovering a lenticular opacity would lead me to do this before the question of operation arose.

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3. MacCallan, A. F.: Some Ocular Manifestations of Focal Sepsis, Proc. Roy. Soc. Med. (Sect. Ophth.) **22**:14, 1929.

It is not always feasible to make a roentgen examination of the edentulous jaws of every patient with cataract, but it is desirable in order to exclude the presence of buried fragments and residual sepsis. If there are sound teeth remaining they should be scaled before the operation. If there are any root-filled teeth in the mouth, it is absolutely essential that a roentgen examination be made of the roots.

An unhealthy appearance of the nasal mucous membrane or of the tonsils should call for the opinion of a rhinologist.

As regards acute glaucoma and thrombosis of the retinal vessels, I am not able to show any statistics of value. It is, however, my personal experience that both conditions are closely associated with focal sepsis.

In February of this year I saw a man, aged 28, who came for glasses, as he had headaches occasionally. With spherical lenses + 0.75 diopter he easily obtained 6/5 vision in each eye. On dilation of the pupils and examination by focal illumination and a pair of Zeiss prismatic lenses giving a magnification of 2, the patient's lenses appeared to be clear; on examination with the slit-lamp, however, they showed innumerable dotted opacities in the cortex.

The patient had recently been to his dentist, who had scaled his teeth and pronounced them all healthy. On looking into his mouth, I saw two decayed third molars which were probably dead and which had abscesses at their roots. The lesson to be learned from this case is that in every case examination must be made with dilated pupils and with the slit-lamp if the ophthalmic surgeon is to give an exhaustive opinion, and also that the opinion of the patient's own dentist is not necessarily of value.

If it is believed that the presence of a focus of sepsis can lead to the development of lenticular opacities, it is also possible to believe that the elimination of the focus may bring further opacification to an end, and that it therefore should be attempted.

While it is advisable to make a bacteriologic examination of the conjunctival secretion at the time that the question of operation is discussed, in practice this may be omitted if sufficient attention is paid to the usual sites of sepsis.

When repeated bacteriologic examination shows the continued presence of pathologic bacteria, some focus of sepsis has usually been overlooked.

When it is necessary to operate in cases in which bacteriologic examination shows the continued presence of pathologic organisms, it may be proper to apply lightly to the whole of the conjunctiva a solution of 2 per cent silver nitrate solution an hour before the operation. All epithelial débris is washed away before the operation, and the procedure is carried out as usual.

It has been supposed by some that after operations for cataract the presence of residual lens substance in the anterior chamber is likely to result in an inflammatory condition. This is entirely contrary to my experience. Residual lens matter that is not sufficient in amount to swell up and cause increase of tension exerts no harmful influence in the absence of a focus of sepsis, provided, of course, that the operation has been carried out *more magistri.*

A useful method of diminishing the risk of sepsis from defective teeth and gums is the daily application of tincture of iodine to the necks of the teeth and to the gums, after a thorough cleansing with brush and dentifrice, for several days previous to and after the operation.

I have no doubt that many of the cases of secondary infection after corneoscleral trephining for glaucoma that have been reported have been cases in which focal sepsis has led to bacterial infection or to damage to the tissues.

COMMON SITES FOR FOCAL SEPSIS

The most common sites for focal sepsis are the mouth, tonsils, intestine, gallbladder, accessory sinuses, prostatic urethra and pelvic organs in the female. In fact, any area of chronic inflammation may provide material for absorption which may cause changes in other parts of the body.

Oral sepsis [4] may be present in several forms, and these frequently coexist: pyorrhea caused by inflammation of the periodontal membrane, apical abscesses, septic stumps, buried fragments of previously extracted teeth, unerupted, impacted teeth and residual sepsis. Having acquired some knowledge of these conditions in the course of conversation with dental surgeons, I shall say a few words about them: 1. Pyorrhea is recognized by the inflamed margin of the gums or by the oozing of pus from between the gum and the neck of the tooth. It is not a mere inflammation of the gums which can be removed by antiseptic lotions, but is an inflammation of the deep-seated periodontal membrane. When of marked degree it is probably incurable except by removing the infected teeth and treating the tooth sockets. 2. An apical abscess is a mass of granulation tissue adherent to the apex of a tooth, containing pathogenic streptococci and necrotic substances with very few leukocytes. The nerve has died or has been destroyed in filling the root of the tooth, and so a tooth with a so-called abscess at its root is generally insensitive. From an apical abscess there is a constant flow of either virulent streptococci or their toxins into the blood stream, and the anatomic position of the lesion prevents an

4. MacCallan, A. F.: The Relationship Between Dental and Ocular Disease, Dental Surgeon **25**:569 (Oct. 13) 1928.

adequate supply of leukocytes and bactericidal body fluids to the part. When it is remembered that with each bite of the jaw, which has an average pressure of 70 pounds (31.7 Kg.) to the square inch, bacteria and their products are pumped into the circulation, it cannot be wondered at that so many ocular and general diseases are rightly attributed to the teeth. As a matter of practice, when I find that a patient has a crowned tooth I have full dental roentgenograms taken and then submit the result for the opinion of the patient's dentist. 3. Septic stumps frequently have an abscess at their roots. They are much more common in all classes of patients than is usually supposed. 4. Buried fragments of previously extracted teeth are detected by roentgen examination. They frequently give rise to toxic absorption. They, also, are extremely common. 5. Unerupted impacted teeth probably always harbor a streptococcus. They are detected by roentgen examination. Unfortunately, the removal of a seriously impacted tooth may be a difficult operation even for the skilled oral surgeon. 6. Residual sepsis or infection of the bone may be indicated in a dental roentgenogram and may be confirmed when operation is undertaken to scrape away the diseased area.

Tonsillar sepsis, while more common in children, is frequently seen in adults. Here the opinion of a throat surgeon must be relied on. In my experience, some of the most serious forms of chronic tonsillar sepsis causing ocular changes have been in persons whose tonsils have been guillotined at some previous date and not adequately enucleated.

The diagnosis of the other forms of chronic focal sepsis occurring in chronic inflammations of the intestinal tract, the gallbladder, the accessory sinuses, the prostatic urethra and the pelvic organs of the female can be arrived at only after elimination of the other possible causes and after examination by a physician.

THE PATH OF PRODUCTS OF A FOCUS OF SEPSIS TO THE EYE[5]

The exciting agent of ocular changes must be living or dead bacteria, the toxic products of bacteria or the disintegration products that result from the action of bacteria on the body cells. In extra-ocular inflammations of the conjunctiva and eyelids it may be occasionally a bacterial infection which spreads by contiguity of tissue or by way of the nose and lacrimal passages.

In some cases of orbital cellulitis there is no doubt that bacteria spread to the orbit by the blood stream from the primary focus, and this may occur in some ocular conditions.

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5. MacCallan (footnote 2). Walter, W.: Teeth and Eye Relations, J. A. M. A. **85**:1720 (Nov. 28) 1925.

However, in most extra-ocular and intra-ocular changes the toxic products are probably the exciting agents. Their path to the eye must be by the general blood stream after being absorbed by the lymphatics.

CONCLUSIONS

1. In certain cases it is possible to cure or to alleviate occular disease by finding and eliminating foci of sepsis.

2. Some forms of ocular disease are usually associated with the presence of foci of sepsis, but a cure cannot be expected by elimination of the focus.

3. In order to arrest the action of foci of sepsis which are causing ocular changes these foci should be found and eliminated.

THE GONIN OPERATION FOR DETACHMENTS OF THE RETINA*

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The object of this paper is to call attention to Professor Gonin's method of treatment for detachments of the retina. For years, Gonin, Hanssen and Vogt have contended that a solution of continuity of the retina plays an important rôle in its separation from the choroid. The therapeutic implication of this view led Professor Gonin to try to occlude the retinal tear by the use of the thermocautery. Having heard of his surprisingly good results, I decided to visit him at his Lausanne clinic. There he gave me the opportunity of familiarizing myself with the details of his technic.

As of any other operation, the success of the Gonin method depends on three factors: (1) the selection of suitable cases, (2) the accuracy of the technic and (3) the cooperation of the patient.

Which cases are suitable? Those in which there are early detachments of the retina that are not too extensive, with one or two tears, or with tears of small size, situated at an accessible portion of the eyeball.

The accuracy of the operative technic depends on (*a*) the careful study and drawing of the fundus, principally of the detachment and tear; (*b*) the proper localization of the tear, or tears, on the outer surface of the eyeball; (*c*) knowledge of the topographic anatomy of the surface of the eyeball, and (*d*) the proper execution of the various steps of the operation.

It is essential to ascertain the patient's cooperation during the period of absolute rest after the operation and his readiness to submit to the repetition of the procedure, if necessary. Any case in which there is a doubt as to the patient's willingness or ability to go through with the undertaking should be rejected.

CLASSIFICATION OF THE RETINAL DETACHMENTS WITH TEARS

According to Professor Gonin, only cases of retinal detachment with a tear or a hole in the retina are suitable for his operative procedure. Purely from the point of view of his method, the retinal detachments with tears may be classified in three groups: (1) operable, (2) nonoperable and (3) doubtful.

Operable cases are those which present one or two tears of relatively small size (from 1 to 4 disk diameters) located at an accessible distance

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behind the ora serrata. The smaller the tear, the smaller the number of tears and the nearer to the ora serrata, the better are the chances of cauterizing the area involved.

Conversely, a large tear, many tears or even a small tear situated in a spot inaccessible to operative endeavor—for example, one very near the posterior pole of the eyeball—is not operable.

The doubtful group includes those cases which, though having a large tear or too many tears, are sufficiently accessible to the cautery and may offer some hope of occluding at least a part of the solution of continuity.

THE RECORDS

The records of the changes in the fundus must be made both by careful drawings and by memorization of the pictures. A practical drawing consists of a circle representing the extreme periphery of the fundus (adjoining the ora serrata). In its center appear the optic

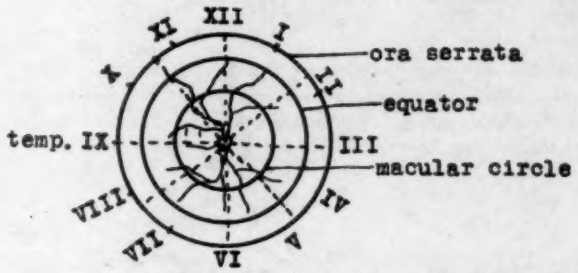

Fig. 1.—Schema of the ophthalmoscopic fundus subdivided into eight sectors. Note clockwise arrangement of numbers.

disk and the branches of the central retinal artery and vein. The circle is divided into eight sectors. On this schematic outline of the fundus, one can draw any type of retinal detachment and tear.

These records are useful, if made at regular intervals during the study of the case and treatment. In making a drawing of a detachment of the retina, one has to follow a certain routine, to avoid overlooking some of the essential points, such as: (1) the location, appearance, elevation and extent of the detachment; (2) the location, number, shape and extent of the tears; (3) the presence of folds and their direction, and (4) the presence, character and extent of other changes in the fundus.

METHOD OF LOCALIZING ON THE SURFACE OF THE EYEBALL THE AREA CORRESPONDING TO THE TEAR IN THE RETINA

When a careful drawing of the changes in the fundus has been made, and a definite conclusion has been reached as to the distance of the retinal tear from the extreme periphery of the fundus (visible to the

ophthalmoscope) and from the vertical or horizontal meridian, it is possible to localize on the outer surface of the eyeball the approximate position of the area of operation. A concrete example may facilitate the understanding of the method of localization.

Suppose the ophthalmoscopic examination of the right eye reveals a detachment of the retina in the lower part of the fundus and a circular hole is found at the extreme periphery, midway between the temporal extremity of the horizontal meridian and the lower extremity of the vertical meridian, or between 7 and 8 o'clock: On the surface of the

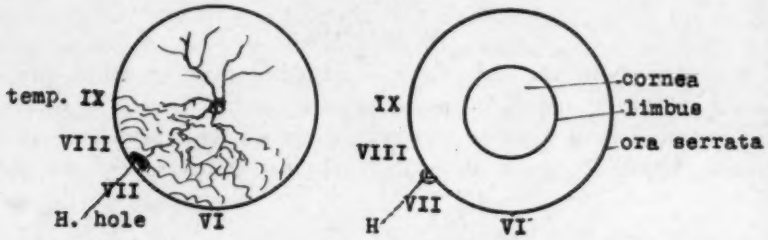

Fig. 2.—At the left is a drawing of the fundus showing the detachment of the retina and a hole in front of the ora serrata; at the right, a drawing of the surface of the eyeball showing that hole H. in the figure at the left is localized 8 mm. behind the limbus corneae (at ora serrata) midway between 7 and 8 o'clock.

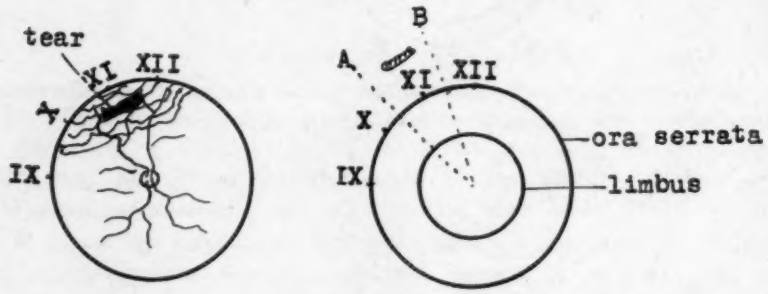

Fig. 3.—At the left is a drawing showing that the tear is between 10:30 and 11:30 o'clock at a point 2 disk diameters behind the ora serrata. Its length is 2 disk diameters (3 mm.) and its width is ½ disk diameter (0.75 mm.). At the right is a drawing showing that on the outer surface of the eyeball, the tear is between *A* and *B*, from 11 to 12 mm. behind the ora serrata. It is 3 mm. long and 0.75 mm. wide (2 disk diameters by ½ disk diameter).

eyeball, this point is located 8 mm. behind the limbus corneae, according to Gonin, and probably a few millimeters farther back, according to my experience, below and temporally between 7 and 8 o'clock.

If the tear is situated at some distance behind the extreme periphery of the visible fundus, the distance is expressed in disk diameters. In other words, the tear is said to be so many disk diameters from the periphery, or so many times 1.5 mm.

Of course, allowance must be made for errors in the estimation of the location of the tear with the aid of the ophthalmoscope. The prismatic effect of the crystalline lens on the course of the rays of light passing through it in a more or less oblique direction, the surgeon's innate error in judging distances correctly, the location of the tear on the summit of a bleb which is itself more or less movable and the estimation of the length of the anteroposterior diameter of the eyeball are the four main sources of error in the localization of the operative area on the outer surface of the eyeball.

A FEW LANDMARKS IN THE TOPOGRAPHIC ANATOMY OF THE SURFACE OF THE EYEBALL

Without an accurate knowledge of the topographic anatomy of the surface of the eyeball, the operator always is in danger of injuring

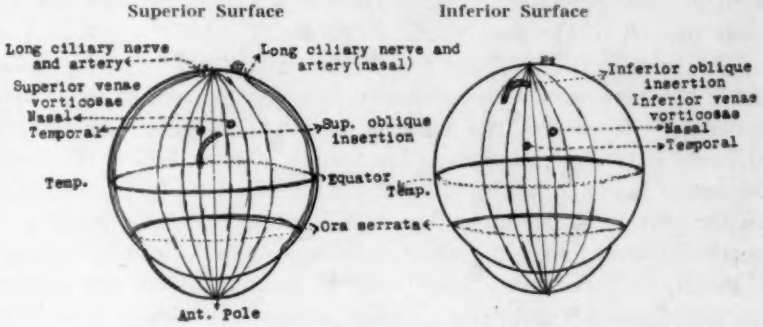

Fig. 4.—A drawing showing "landmarks" on the surface of the eyeball: at the left, the superior surface of the eyeball is outlined, and at the right, the inferior surface. The distances from the limbus corneae to the various "landmarks" are as follows: To the ora serrata, 8 mm.; to the equator, from 13 to 13.5 mm.; to the superior temporal vena vorticosa, 20 mm.; to the superior nasal vena vorticosa, 21 mm.; to the inferior temporal vena vorticosa, 18 mm.; to the inferior nasal vena vorticosa, 19 mm.; to the superior oblique insertion (*a*) temporal extremity, 14 mm.; (*b*) nasal extremity, 19 mm.; to the inferior oblique temporal extremity, 18 mm.

nerves, blood vessels, muscles or tendons, the lens, the ciliary body, etc., during the Gonin operation.

The surface of the eyeball is divided by the equator into two halves. One third of the anterior half is occupied by the cornea. Around the limbus of the cornea there is a circular zone, from 5 to 6 mm. broad, underneath which lies the ciliary region. A circle drawn on the surface of the eyeball 8 mm. behind the limbus corresponds to the ora serrata. Another circle, parallel to the limbus and from 13 to 14 mm. behind it, corresponds to the equator. The majority of retinal detachments occur between the ora serrata and the equator. Behind the equator are the four points of exit of the venae vorticosae, two on the upper, and

two on the under, surface of the eyeball. Knowledge of the location of these veins is essential, if one desires to avoid them during the performance of ignipuncture. The superior venae vorticosae are situated one on each side of the vertical meridian. The superior temporal vena vorticosa is 7 mm. behind the equator, while the superior nasal vena vorticosa is 8 mm. behind the equator. The superior temporal vena vorticosa is nearer the vertical meridian than is the superior nasal vena vorticosa. The lower venae vorticosae are similarly arranged on the under surface of the eyeball behind the equator, one on each side of the vertical meridian. The inferior temporal vena vorticosa is nearer the vertical meridian and only 5 mm. behind the equator; the inferior nasal vena vorticosa is farther away from the vertical meridian and 6 mm. behind the equator. In other words, a circle 3 mm. in diameter, drawn around the eyeball, from 5 to 8 mm. behind the equator, or from 18 to 21 mm. behind the limbus cornea, will pass through the four points of exit of the four venae vorticosae.

The line of the insertion on the eyeball of the superior oblique muscle lies between and somewhat in front of the two superior venae vorticosae. It crosses the vertical meridian obliquely; its temporal extremity is 14 mm., and its nasal extremity 19 mm., behind the limbus. The ocular insertion of the inferior oblique muscle is so far behind the equator that it is not accessible to Gonin's procedure, except at its temporo-anterior extremity, which is 18 mm. behind the limbus corneae.

Finally, it is necessary to consider the location of the two posterior long ciliary arteries and nerves. They perforate the sclera, a nerve and an artery on each side of the optic nerve, and run between the sclera and the choroid in the horizontal meridian until they reach the ciliary region, where they distribute their branches to the iris, ciliary body, etc. Their course is underneath the recti externus and internus.

To summarize: It is important to avoid the region of the venae vorticosae, the line of insertion of the superior oblique muscle, the anterior extremity of the ocular insertion of the inferior oblique muscle and the horizontal meridian of the eyeball, underneath which lie the long posterior ciliary arteries and nerves.

The figures and measurements given in this paper are only approximate. No attempt was made to be correct mathematically, since the problem at hand is not suitable for this.

DATA ON CERTAIN TOPOGRAPHIC MEASUREMENTS OF THE EYEBALL

The anteroposterior diameter of the eyeball in an emmetropic eye averages 24 mm. (the transverse and vertical diameters are a fraction of a millimeter less).

The circumference of the eyeball is 3.14 by 24, or 75.36 mm. To facilitate calculations, this may be considered as 76 mm.

The distance from the anterior pole to the posterior pole of the eyeball measured on one meridian on the surface of the eyeball is 38 mm.

The distance from the anterior pole to the limbus is 5.5 mm. in the vertical meridian and 6 mm. in the horizontal meridian.

The ora serrata is situated 8 mm. behind the limbus.

The equator is midway between the anterior and posterior poles, 19 mm. behind the anterior pole, or from 13 to 13.5 mm. behind the limbus.

The extreme periphery of the fundus visible to the ophthalmoscope is, according to Gonin, at the ora serrata, 8 mm. from the limbus, or more probably it is midway between the ora serrata and the equator, 10 mm. behind the limbus.

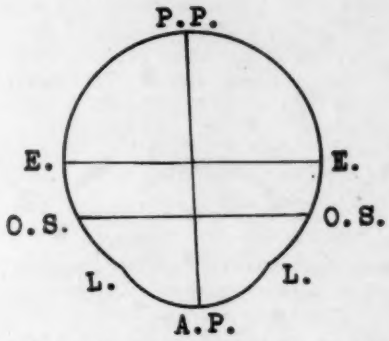

Fig. 5.—A.P. indicates the anterior pole; P.P., the posterior pole; L., the limbus cornea; O.S., the ora serrata; E, the equator, and A.P.-P.P., the antero-posterior diameter.

The distance from A.P. to P.P. is 24 mm.; from A.P. to L, from 5.5 to 6 mm.; from L. to O.S., 8 mm.; from A.P. to E. to P.P., 38 mm.; from A.P. to L. to E., 19 mm., and from L. to O.S. to E., from 13 to 13.5 mm.

THE GONIN OPERATIVE METHOD

1. A drawing of the retinal detachment with its tear in proper topographic relation to the extreme periphery or to the optic disk must be carefully done beforehand. This enables the surgeon to form a definite idea as to the location on the surface of the eyeball of the area in which the ignipuncture is to be applied.

2. The pupil is widely dilated by the use of a few drops of 1 per cent solution of atropine. Local anesthesia is obtained by instillations of a 1 per cent solution of holocaine or a 4 per cent solution of cocaine drops. Ten minutes before the operation, a few drops of a 2 per cent solution of procaine hydrochloride, to which 1 or 2 drops of epinephrine hydrochloride (1:1,000 solution) have been added, are injected underneath the bulbar conjunctiva adjoining the operative area.

3. In order not to lose the sense of direction regarding the location of the retinal tear, when the eye is turned or pulled in an extreme position upward or downward during the operation, a black suture (fig. 6*A*) is passed through two

opposite points on the conjunctiva adjoining the limbus corneae in such a manner that the continuation of this suture in a straight line would pass through the center of the area of operation.

4. The patient is told to look in the direction necessary to expose to view the area to be ignipunctured. If his effort is not sufficient, a strong suture is passed underneath the tendon of one of the respective recti muscles and a pull in the proper direction is thereby exerted.

5. The conjunctiva is then incised for from 4 to 5 mm. by a few snips of the scissors, parallel with the limbus corneae; care should be taken that the line of incision should be a few millimeters nearer the limbus than the area of operation. The sclera is exposed by retraction of the conjunctiva with two blunt hooks. The measurement is then taken from the limbus corneae to the area of operation, with the aid of calipers and a millimeter ruler, along the directing suture for the proper location of the point of ignipuncture. The corresponding point on the sclera is then marked with the point of a sharp instrument.

6. An incision of from 2 to 3 mm. is made with a narrow Graefe knife through the sclera, choroid and retina in a meridianal direction. Following this incision, vitreous flows out, but if no undue pressure or traction is exerted on the eyeball, this flow of vitreous soon ceases. The surface is gently sponged

Fig. 6.—*A*, in the three drawings, indicates the directing suture. In the first drawing, the eye is seen in primary position. In the second drawing, the eye looks down and nasally. *B* indicates the area corresponding to the tear in the retina, and C, the direction of the incision in the conjunctiva bulbi. In the third drawing, C^1 indicates the exposed sclera and *F* the scleral incision for the introduction of the cautery tip.

dry, and from 3 to 4 mm. of the tip of a cautery (brought to a white heat) is introduced into the eyeball, kept there for from two to ten seconds and then slowly removed.

7. The conjunctival incision is sutured, the directing and fixation sutures are removed, an ophthalmoscopic examination is quickly made to ascertain the effect and the location of the ignipuncture, atropine salve is introduced into the conjunctival sac, and both eyes are bandaged.

The description of this method follows pretty nearly that of the technic of Professor Gonin. It must not be forgotten that there is no rigid rule regarding the technic of the operation. One has to adapt the method to the peculiarities of the individual case. A multiplicity of tears or holes, a long tear, a soft eye, etc., require deviations.

After-Treatment.—The patient should remain perfectly quiet in bed for six days. He should remain (if possible) constantly in such a position that the vitreous presses by gravity against the retina of the eye on which the operation was performed. The foot of the bed is to be raised about 12 inches (30.48 cm.). Little food should be given, and opiates should be administered to prevent bowel

movements during the first six days. Since there is no appreciable amount of pain, there is rarely need of codeine or acetylsalicylic acid. The eyes are kept bandaged for six days. The conjunctival sutures may be removed in from eight to ten days after the operation. One more week of gentle care and rest in bed for a part of the day completes the after-treatment.

If the localization of the tear has been erroneous and the cauterization has been done too far from the tear, the procedure must be repeated. In this case, it is much easier to find the correct place to be ignipunctured, since one can see with the ophthalmoscope the relation of the tear to the area first cauterized.

One cannot yet state positively that ignipuncture is an absolutely harmless procedure. In my limited experience I have never seen a harmful effect. Future experience gained by a large number of ophthalmologists will show the possible complications. Assuming that the necessary care is always being exercised to prevent injury of important tissues (lens, ciliary body, muscles, blood vessels, nerves, etc.), one must not forget that repeated ignipunctures produce scars in the sclera, choroid and retina. Certain consequences, such as a distortion of the shape of the eyeball, a weakening of the scleral resistance in the area treated, a late retraction of the scar in the choroid, etc., are possible.

The question as to the extent of reaction of the tissues (sclera, choroid and retina) ignipunctured has not yet been answered. An incandescent wire is introduced into the eyeball and the walls of the latter are burned. How far out does this burn extend? This depends on the degree of heat and the length of time during which it is applied. Since the answer cannot be obtained by the study of human eyes, experiments have been made on rabbits' eyes. The electrocautery was applied on rabbits' eyes for different lengths of time, in some only superficially, in others deeper, and in others complete punctures were done. A study of the slides will be published as soon as possible.

REPORT OF CASES

Six Failures.—My experience with the Gonin operation is limited to ten cases. The first four cases were not suitable, and inexperience with the operative indications is the only excuse for having attempted this operation in these cases. But since failure is often a good teacher, it is appropriate to give an account of these four cases.

CASE 1.—In 1912, Mr. J. A., aged 61, had a detachment of the retina of the right eye. In 1928, he had an almost total detachment of the retina in the left eye, with several tears of various sizes. One ignipuncture in the region of the largest tear did not, of course, reattach the entire retina. As the patient lived out of town, he could not return for repeated ignipunctures.

CASE 2.—Mr. L., aged 30, presented high myopia in both eyes and detachment of the retina in the right eye. No tear was visible. One ignipuncture had no effect on the detachment. The patient could not return for another treatment.

These two cases belong to the group of those which, on account of the inability of the patients to cooperate, are not operable.

CASE 3.—Mrs. S., aged 65, had cardiac disease and angiosclerosis. For many years she had been blind in the left eye as the result of a total detachment of the retina and cataract. In the right eye, the retina showed numerous large hemorrhages and an extensive detachment. Vision was reduced to seeing movements of the examiner's hand. After the patient had had several months of rest, the retinal hemorrhages resorbed, but the detachment remained unchanged. No tear could be seen. Two ignipunctures had no appreciable effect on the detachment or on the acuity of vision.

CASE 4.—Mr. G., aged 60, showed bilateral chronic uveitis. He had a large retinal detachment below in the right eye. No tear was visible. The vitreous was studded with dusty and pigmentary opacities. Vision in the right eye was limited to perception of light below. Following the first ignipuncture, even the perception of light was lost in that eye for about one week. After the second ignipuncture, perception of light returned, but the retina remained detached.

In cases 3 and 4, the result was nil. Professor Gonin advised against operating in cases showing no tears of the retina.

CASE 5.—Mrs. P., aged 34, was successfully operated on in 1928 by Dr. Grout for cataract in the left eye. Vision was 20/20. Five or six weeks after the operation, she had two falls, and the retina became detached over a large area of the affected eye. Vision was barely 4/200. In the lower nasal sector of the fundus was a suspicious-looking red area which was taken to be a tear. Three ignipunctures were performed, but the vision and field did not improve to an appreciable degree.

CASE 6.—Mrs. J., aged 38, a patient of Dr. Slomka, had myopia of 5 diopters in each eye. Vision to October, 1928, was: right eye, 20/50; left eye, 20/30. In November, 1928, a detachment of the retina developed in the right eye, and within ten days it extended over almost the entire fundus, so that vision was reduced to seeing movement of the hand. Eight months later, vision in the left eye also became blurred as a result of a retinal detachment in the upper temporal field. A curious, large, V-shaped tear in the detached retina could be seen, with the torn portion projecting forward deep into the vitreous. Vision was still 20/30. The condition remained unchanged for four months; then, during an attack of severe bronchitis, the retina adjoining the tear began to become detached. The lower part of the field of vision was absent, and the acuity of vision was reduced to counting fingers at a few feet. It was calculated that the tear was about 16 mm. behind the limbus at about 1 o'clock. After the ignipuncture was performed, the ophthalmoscope revealed that the cauterization was not made far enough back. About one month later, a second ignipuncture was performed. Determined to apply it farther back, I made a tenotomy of the superior rectus beforehand so as to be able to turn the eye farther down, and, in order that as little vitreous as possible should be lost, I used the hot platinum point of the cautery as a means of puncturing the wall of the eyeball. The puncture was made at a point 19 mm. behind the limbus. This time the cautery touched the temporal limb of the V-shaped tear. One week after the operation, when the eye could be examined, one could see the cauterized area and, unfortunately, a large retinal balloon-shaped detachment extending over the upper nasal, as well as the lower, part of the fundus. In addition to this, there were from two to three grayish, flat

patches of tissue (necrosed pieces of retina that had fallen off) floating in the vitreous. Transparent strands (vitreous?) extended from these patches back to the retina. The only portion of the retina that seemed still attached was in the nasal inferior sector of the fundus. During the following months, the retina became detached in this field also, and several small retinal holes appeared below and nasally.

Following the course of the acute development of the retinal detachment first in one eye and then in the other, one cannot help considering this type as malignant. The V-shaped tear and the projection of the torn, tongue-like retina into the vitreous are unusual. An ignipuncture at the appearance of the retinal tear would have prevented the development of the detachment.

Four Successful Cases.—There would be good reason for placing a question mark after the word "successful." Not until these cases have been observed for a period of years can one decide whether the operation is a success.

CASE 7.—A. W., aged 49, came in 1916 to the Knapp Memorial Dispensary with a fully developed retinal detachment and complicated cataract in the left eye of two months' duration. The right eye had normal vision with a correction of -0.75 sphere -50 diopter cylinder axis $\times 180$ degrees. Eleven years later, the patient returned, with a retinal detachment in the right eye. His vision in the upper part of the field was reduced to seeing movements of the hand. In the course of one year, the detachment gradually shifted to the lower two thirds of the fundus. Besides this, a bullous detachment with two holes was found in the upper nasal sector.

On Jan. 10, 1929, two years after the onset of the trouble, vision in the upper and nasal part of the field was reduced to seeing movements of the hand. A Gonin operation was performed with the object of sealing the retinal tears. The ignipuncture was repeated on January 24. On February 4, the patient could count fingers at 5 feet (152.4 cm.), although the extent of the retinal detachment appeared to be the same as before the operations. A third ignipuncture was performed on February 21, and a fourth on June 24. The patient's vision gradually improved until he was able to read the first three lines of the Snellen chart at arm's length, and his field of vision became somewhat better, so that he could move about more freely. There is still considerable retinal detachment below.

The interesting features in this case are: (1) unsuitability of the case for this operation (the detachment was two years old), (2) the number of ignipunctures and (3) the relatively marked improvement in vision.

CASE 8.—Mr. S., aged 46, showed a myopia of 7 diopters in the right eye and of 6 diopters in the left. At the beginning of January, 1930, vision in the right eye became suddenly blurred. A retinal detachment was found in the lower temporal sector. Numerous pigmented patches of chorioretinal atrophy were visible at the periphery all around. In the macular region was a pale pink area of retinal depigmentation. The vitreous was fluid, and a few heavy floaters and spare dusty opacities were noticeable. The vision was: right, 20/50; left, 20/30. The result of four weeks' rest in bed with the eyes bandaged was that the detachment had extended above the macular area, so that vision in the right eye became reduced

to 5/200, and a tear appeared at the periphery of the detached retina. An ignipuncture was performed during the first week of February, with the result that the tear was caught in the cauterized area. The field, which had shown a defect in the nasal and upper part, improved to the extent that all colors were easily perceived all around, and the acuity of vision returned to 20/70.

The following two cases are reported with the permission of Dr. Arnold Knapp.

CASE 9.—Mrs. P., aged 24, came to the clinic in November, 1929, with a detachment of the retina of unknown etiology in the left eye. Vision was: right, 20/20; left, 3/200. A tear was found in the lower temporal sector of the fundus, and an ignipuncture was performed by Dr. Knapp on Nov. 26, 1929. Two weeks later, when the patient was discharged, her vision was 20/70, and the superior hemianopic field defect that was present before the operation had almost entirely disappeared. There was still a small bulbous detachment in the lower part of the fundus, but the macular area was free.

CASE 10.—Miss Jenny C., aged 18, had had her left eye operated on when she was at about the age of 9, for a congenital cataract. In 1922, the right eye had a myopia of 2 diopters, with a vision of 20/30. In 1927, an acute chorioretinitis (tuberculous?) developed and in January, 1930, she returned with a shallow retinal detachment with a tear in the right eye. Vision (with correction) was limited to counting fingers at 3 feet (91 cm.). On Jan. 7, 1930, Dr. Knapp made an ignipuncture. The tear was caught in the cauterized area, and her vision, corrected by —10 sphere —2 diopters cylinder axis × 10 degrees, returned to 20/70 plus. The field of vision, moderately contracted nasally before the ignipuncture, is fairly normal now.

CONCLUSION

In conclusion I wish to repeat that as in any other operative procedure success depends on the three factors mentioned at the beginning of this paper: the selection of suitable cases, the accuracy of technic and the cooperation of the patients.

I have learned one important lesson from the study of patients with retinal detachments, and this is the necessity of a meticulous ophthalmoscopic examination of the extreme periphery of the fundi of myopic patients. There is no doubt in my mind that patients with peripheric chorioretinal atrophic patches are more prone to tears of the retina and to secondary detachment. Such patients should be insistently warned against jarring their bodies, considerable reading, long rides and violent exercise.

Professor Gonin gave me the opportunity of familiarizing myself with the details of his technic. Dr. Arnold Knapp gave me permission to report on two of his cases.

CAUSES OF FAILURE IN OPHTHALMIC OPERATIONS *

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Obviously the cause of failure in any surgical operation is the exercise of poor judgment. In a certain percentage of cases this may result in erroneous diagnosis. Again, failure may originate from the improper selection of the operative procedure, or the application of a procedure much too vigorous for the particular patient. In another group of cases the failure may be closely associated with the surgeon's inability to exercise his best surgical sense in the various eventualities that may arise in a complicated case.

It is essential, therefore, that the student of ophthalmology who is doing postgraduate work should have the counsel and results of a surgeon of experience as a guide, so that he may avoid pitfalls that have been found to have a remedy. It is not sufficient that he witness display of skill, and marvel at the dexterity of some master, since ambition to imitate takes one over perilous paths. Rather should he interest himself in the various steps that have led up to the operation, and the sequences that follow when the patient has left the operating table. Knowledge of this character places him in command of the situation, and the mechanical features of the operations fall into their proper relation to the other factors in ophthalmic surgery.

The matter of diagnosis is especially important, and with the modern methods at one's command, much information can be obtained with accuracy which previously had to be assumed. Assumption of a situation is a human attribute that thrives on the slightest encouragement, and the determinations with even the most accurate instruments of precision are likely to be misinterpreted by some enthusiast who can always find just what he is looking for. The development of judgment requires an atmosphere of repose. The neophyte must, therefore, always be on his guard, and can do no better than utilize all the patients assigned to him for examination in order to determine for himself the normal variations in the average eye or rather of the eyes of the patients who present themselves for examination and treatment. The clinical material studied by my associates and myself is made up, for the most part, of persons who have some symptoms referable to the eye, and

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* Elaborating lectures delivered to the class in Ophthalmology at the Graduating School of Medicine of the University of Pennsylvania, Philadelphia.

who cannot be regarded as entirely normal in this regard. But since our subsequent experience is to be with such average people, one must familiarize oneself with all the changes they present.

Working along this line, one may be able to find many serious diseases in their incipient state. Also, one may find many anomalies of structure and function that are of no surgical significance. Too much stress cannot be laid on this feature of human life, since it extends to every branch of practical medicine. The determination as to when a certain group of phenomena passes from the stage of physiologic adjustment to circumstances and when this same group is an evidence of beginning pathologic changes is a quality one should aim to acquire, since this makes for a practitioner of merit as against one of mediocre attainments.

The first group of causes of failure may then be readily overcome once one has developed a reasonable degree of diagnostic skill. This, as I have already implied, requires an infinite amount of persistence and skill to attain, but is worth all one may invest in it.

Rather closely allied to diagnosis as a factor in failure in ophthalmic operative procedure is an indifferent acquaintance with the anatomic detail of the various structures of the eye. Thus the true form, thickness, extent and resistance of the cornea must be understood, and here nothing makes for knowledge like the postmortem study of the eyes of the lower animals and of man. This study of anatomy in its comparative form is most essential to a proper understanding of the difficulties one frequently encounters. The slit-lamp and corneal microscope provide means of study as regards the human eye which has not been available heretofore. The anterior chamber, for instance, is not quite so simple a space as first glance would seem to show. Nor is the angle of the anterior chamber so readily accessible from the outside as a casual inspection would seem to indicate. That it is not concentric with the visible corneoscleral junction is a surprise that awaits many.

Assuming, however, that one has a good fundamental knowledge of the anatomy and physiology of the eye, and has exercised reasonable diagnostic skill to determine the type of disorder from which the patient is suffering, one's equipment is not yet complete enough to enable one to assume the responsibility of a surgical case. There is yet that surgical judgment which will determine whether the patient is a good operative risk, granting that the mechanical part of the procedure and the after-treatment are well in hand. A patient in good health, with good habits and a good history as regards recovery from acute conditions, obviously should do well under any elective operation. But it should be borne in mind that few of these people develop cataract (unless it is of the traumatic variety) or glaucoma.

Cataract developing in persons past the spring time of life is but a single part of a complex pathologic process which is not completely comprehended. Some cataracts have had their origin before birth and some from injuries or disease of the eye; even the classic senile cataract has been shown by students of the slit-lamp to have begun years before its presence was suspected. While those cases incidental to a frank uveitis seldom fail to be associated with diseases of the other parts of the eye, the idea that the other types may have a somewhat similar association has been stressed only in the last few years. Also, the development of senile cataract on one of the other congenital types is a modern discovery which has been proved by the slit-lamp.

Accepting this relationship that the cataract is only an obvious part of a complex pathologic process, one should become acquainted with as many of the other manifestations of dysfunction or disease in the patient as possible. This means the intensive study of the individual patient for a sufficient period to determine his ability to compensate in such disturbances as do not readily respond to treatment. Sometimes the patient is generally run down and requires rest and regular feeding to place him on an operative level. Again, he may be absorbing poisons from some focus of infection, as the teeth or tonsils. Internal foci such as come from gallbladder disease and appendicitis of a chronic type are not so easily determined. Diabetes, Bright's disease, cardiovascular disturbance and diseases of the ductless glands are frequently brought to light when one of these "run-down" persons is under observation for a while.

Diabetes as it occurs in the patient who presents himself for an operation for cataract means very little. Glycosuria to the extent of 3 per cent and hyperglycemia to the extent of 170 may be ignored with safety. Other forms of ocular diabetes require more serious consideration. It is a debatable point as to what percentage of cataracts occurring in the presence of diabetes are directly traceable to the diabetes. Cataract in young persons with diabetes is uncommon, and it is therefore assumed that senility is the greater factor in these cases. Also, the complications which diabetes is so prone to produce in other operations are negligible in ophthalmic surgery.

Our experience with patients showing cardiorenal and cardiovascular diseases has been most gratifying. Very few have shown complications of a greater seriousness than the ideal case not so associated. We are extremely careful, however, to determine whether the patient has been able to function properly under the least stress, and then we place him at rest so that his vital organs will be relieved of every possible strain, at least until convalescence from the operation on the eyes has been reestablished. Without this appreciation of both diabetes and the con-

ditions mentioned in the foregoing paragraph, a great number of blind persons would have been deprived of the pleasure of regaining their sight, and thus their final days would have been quite tragic.

FACTORS INHERENT IN FIELD OF OPERATION

Having disposed of the factors inherent in the patient, those inherent in the field of operation will be considered. The average eye is well prepared to resist many infections to which it is exposed. Were this not true, almost every person would have some violent inflammatory condition of the conjunctiva. The tears provide a protection, but under conditions which they select for themselves. The instillation of medicines and the manipulations of the eyes by the fingers and by instruments provide additional factors for which the tears are not prepared. It is therefore highly essential that no infecting agents are brought in contact with the eye. The greatest care must be taken in the preparation of the anesthetic solution which is usually cocaine, as well as in the preparation of all solutions to be used before, during or after operation. It is our practice to flush the entire conjunctival culdesac thoroughly with a 1:5,000 solution of mercuric chloride; a glass tip which may be inserted well up under the lids is used, while the solution is delivered through a rubber tube from a glass reservoir suspended above the patient. A half strength physiologic solution of sodium chloride is used to neutralize the mercury solution and to restore an isotonic solution for the tears. Preliminary to the flushing the eyebrows and lashes may or may not be removed, but in any event they are scrubbed with tincture of green soap (with the eyes closed, of course) and then with benzine, tincture of iodine and alcohol.

If the lashes and brows are to be removed it is necessary to cover the hairy areas with petrolatum, after which the scissors are used to remove the hair. This compels the hair to cling to the scissors and thus prevents any being lost in the conjunctival culdesac. This may appear to be an unnecessary precaution, but one vagrant hair beneath the lids can produce a great deal of trouble, and prevention is the better procedure. Removal of the lashes and brows is not an unmixed blessing. During convalescence, the outgrowing hair may produce so much annoyance as to cause the patient to rub the eye, and thus encourage complications that might follow such traumatism.

A great amount of discussion has been given the matter of the eye speculum as contrasted with the lid retractors. It is quite the vogue to attribute a series of complications to the pressure of the spring speculum. The speculum with the stop on it is particularly subject to condemnation, yet many able surgeons have employed it without any more complications than follow the use of the spring speculum without the stop or the long lid elevators as used by Colonel Smith. A quickly acting mind will

supplement the disadvantages of all three of these instruments, since all of them have their decided advantage. Our preference is for the speculum made by Weiss with a medium spring, although at times we find it best to have this made with the distal parts on a hinge so that the larger part of the instrument may drop out of the way. In some cases we employ one in which the lid portion is a wire loop, and in others one in which this portion is a flat sheet of metal which falls over the lid and protects it. It seldom happens that the speculum exerts any pressure on the eye, especially when canthotomy has first been performed. But the patient who is disposed to "squeeze" can find a way to turn every instrument in or near his eye to his disadvantage. Hence, the surgeon and his assistants must have quickly acting minds to sense the moment when it is essential that all restraining apparatus be immediately removed. It is most creditable to ophthalmic surgery that the training of the surgeons is such as to render complications from this source as of unusual occurrence. This brings the discussion back to its beginning: The skilled man can use the instrument with which he is most familiar with the minimum degree of accidents.

EXTRACTION OF CATARACT

Since the most prominent operation in ophthalmic surgery is extraction of cataract, the incision in the cornea occupies a prominent part in a consideration of this subject. The size of the incision is the most troublesome of the complications to date. Infection of the cornea has been almost entirely eliminated. The incision, if too large, may result in complete or partial eversion of the globular contents, but it is rare. The more common condition is that of making the incision too small or improperly placed as to its angularity, so that the outside opening in the cornea is smaller than the inside opening. This is first recognized by the difficulty with which the iris forceps can grasp the iris in the subsequent iridectomy. In such a case the lens is certain to engage in the corneal wound during the attempts at its delivery. This situation may be readily met by enlarging the wound with straight angular scissors, and the operation can then proceed without further ado. But a failure on the part of the operator to grasp the true significance of his difficulties will result in a luxation of the lens into the vitreous, if the consistency of that structure is rather soft or watery; on the other hand, if it is resistant, and the anterior lens capsule is opened, considerable cortical matter may be milked from the cataract, with the ultimate delivery of the nucleus. Meanwhile, the eye has been subjected to an unwarranted amount of traumatism which will be reflected in a host of complications. The cortical matter thrown into the anterior chamber may be removed by irrigation, but even at best this is seldom complete in these cases, since the surgeon fears the effect of too much manipula-

tion in an eye that has already been handled considerably. After a series of inflammatory reactions, such an eye quiets down, with an occluded pupil and an iris enmeshed in an opaque secondary cataract. One or more iridotomies are then required. Such a case certainly ends in failure, although before this is admitted one has been called on to exercise all one's skill and ingenuity to achieve something in a case in which the chance of good results has been ruined from the start by a small and improperly placed incision.

By no means does this tragic course occur in every case in which a small incision is made in the cornea. Many times the situation is remedied by enlarging the incision immediately, but I am speaking of those cases in which this is not done early. The only way in which this may be circumvented is by continuous observance of opportunities for operating on pigs' eyes or eyes removed post mortem, since this error is made not only by the tyro, but by men of experience. In the case of the latter, their extended experience brings with it, as a rule, judgment concerning the way out. The tyro becomes too embarrassed to exercise the knowledge he has obtained vicariously, and often must learn for himself.

It cannot be stressed too strongly or too frequently that one of the greatest factors in impairing the ultimate result of any surgical procedure is excessive manipulation. Violence attends every ophthalmic operation, and a certain degree of it is withstood without disaster, but in every step in an operation on the eye this necessary violence should be reduced to a minimum. The number of instruments used, the character and condition of the instruments and the dexterity with which they are employed, while of importance in general surgery, are of special significance in ophthalmic surgery as every reaction is attended by structural changes likely to impair the transparency of the mediums and thus involve sight.

While extraction of cataract without iridectomy gives a most desirable result when uncomplicated, the surgeon of average experience would do better to perform iridectomy, either some time before the extraction or immediately before the main operation. This affords the only reliable safeguard against glaucomatous symptoms, which may ensue in any case, but more especially when a small amount of cortical lens matter has been allowed to remain. We endeavor to clear the pupil after extraction by irrigation of the anterior chamber with a half strength physiologic solution of sodium chloride. A metal tip irrigator directs the flow of the solution over the cornea near the incision from a glass reservoir held a short distance above the head of the patient. This removes a great deal of the lens matter in the pupillary area by suction. The tip may also be placed within the corneal incision with comparative safety and the anterior chamber thoroughly irrigated, provided the force

and rate of flow of the fluid are not too great. The justification for this irrigation of the anterior chamber has been the subject of considerable discussion. The procedure itself is devoid of danger, but in the hands of the clumsy or hurried operator its disadvantages can readily be seen.

The routine extraction of cataract usually calls for the opening of the anterior lens capsule, after which the nucleus and adherent cortex are gently expressed from the eye. This procedure enables many surgeons of limited experience to accomplish this wonderful operation with a limited amount of complications, but the operation of removal of the lens in capsule eliminates all those embarrassing sequences that follow the retention within the eye of any amount of cortical or capsular material. The latter operation, however, should be performed only by the operator of mature judgment and experience. Our technic permits us to assume that we will deliver the lens in capsule. Should circumstances not be favorable to that type of operation, we may then return to the conventional operation with no influence except a good one on the situation.

In the passage of the von Graefe knife across the anterior chamber, it is our custom, when the depth of the chamber encourages it, to dip the point of the knife into the anterior lens capsule and bring forward the entire lens before withdrawing the knife and completing the section in the cornea. This variation in the technic was first brought out by Trousseau and serves to facilitate the luxation of the lens and the opening of the capsule while the eye is yet intact and there is no possibility of danger from anterior prolapse of vitreous through the open corneal wound, which at this time is merely a puncture filled with the blade of the knife.

In the event that this is not done, we employ the cystotome after iridectomy in a manner somewhat different from most operators. The instrument is modeled after that of Jaeger, and the long arm is operated from the side of the patient and not from above as in the case of the straight cystotome. The sharp end of the instrument is engaged in the lens near its inferior border and well beyond the pupillary border of the iris. The instrument is then used to rotate the entire lens so that its zonule may be ruptured and the lens be permitted to rise into the anterior chamber. The lens is thereby luxated anteriorly. Should the anterior lens capsule be stronger than the zonule, this will readily be accomplished, but should the anterior lens capsule be the weaker, it will be lacerated; the surgeon readily recognizes this by the lessening of the tension at the end of the instrument. The surgeon then proceeds with the usual cystotomy, opening the capsule all around so that the nucleus of the lens may readily pass out when the pressure and counter-pressure are applied for the delivery of the cataract.

The object of this variation is to remove as much as possible of the cataractous lens from the eye at one sitting. Infection from without in cases of cataract extraction has been reduced to the minimum, but in a definite percentage of cases results are unfavorable because of the reactions that follow the retention of cortical lens matter. Often it appears that this material acts as a foreign body introduced from without on which an endogenous infection is introduced through the blood stream. However this may be brought about, the uveal tract, as represented by the iris, ciliary body and choroid, certainly resents the presence of the free cortical and capsular material in close contact with it, and this causes most of the failures after many well executed operations. While many procedures have been devised for combating the bad effects thus produced, none is comparable to the methods recommended for the prevention of this retention of lens matter. Here the intracapsular operation acquires its prestige.

However, if some lens matter is of necessity retained, we resort to the intra-ocular irrigation with a half strength physiologic solution of sodium chloride in the manner referred to previously in this article The small, flat, slightly curved metal tip need not always be introduced into the anterior chamber; running the flow of liquid over the corneal incision frequently creates sufficient suction to carry out of the anterior chamber considerable of the cortical débris. This procedure should be tried before introduction of the tip within the eye. When placed in the anterior chamber, gentleness of manipulation, together with a slow rate of flow of a warm solution, will render this procedure devoid of unfavorable effects. The poise of the surgeon will go far toward creating corresponding repose on the part of the patient.

Loss of vitreous is a factor of importance in all operations in which the globe is opened. A normal vitreous is seldom lost unless the eye is subjected to an unusual amount of trauma or violence. The Smith operation for cataract is particularly liable to this complication, especially in unskilled hands. A low consistency of the vitreous, however, is rather frequent in the hands of men of experience, for the reason that such surgeons are more likely to assume a risk for a patient in order to give him the benefits that might follow the removal of an opaque lens. We have found that in the absence of other complications the loss of even as much as a third of the vitreous is unattended with disaster, provided an attempt is made to restore the bulk of the vitreous with the half strength warm physiologic solution of sodium chloride. But there is always a possibility that a detachment of the retina or a hemorrhage may also take place. Clinically, these cases do not provide so many poor results as do those cases in which iridocyclitis follows the retention of cortical or capsular matter. In the latter, the iris becomes incarcerated in the retained lens matter, and a closed pupil results, necessitating iridotomy later. Needling, which had such a great vogue

in these cases a few years ago, in our hands has been entirely superseded by iridotomy.

Failure in cases of glaucoma may be attributed in most instances to a failure on the part of the operator to perform the drainage operation in the proper location. In those cases which are seen at our service subsequent to a trephining operation by other surgeons, and in which enucleation was required, microscopic examination of the specimen has shown that the trephining was done too far in front of the angle of the anterior chamber. In the cases in which iridectomy was performed, the iris was found to be intact at its base and only the pupillary edge excised. The broad iridectomy of von Graefe, which is our operation of election, fails to effect a result only when the condition is too far advanced and progressive changes have taken place in the nerve. Occasionally, even the courageous as well as careful operator may err in doing some unavoidable violence to the lens by the tip of his instrument, and this structure becomes opaque. While this entails a subsequent operation for the removal of the cataract thus produced, it is not entirely devoid of benefit to the patient. Sclerotomy never fails as to the attainment of the immediate objective, but often fails as to permanent results.

In the various other operations performed in and about the eye, complications are rare, but failure as to ultimate result may be attributed to timidity in applying one's knowledge and skill to the full extent indicated by the problem in hand.

THE CHIASMAL SYNDROME

OF PRIMARY OPTIC ATROPHY AND BITEMPORAL FIELD DEFECTS IN ADULTS WITH A NORMAL SELLA TURCICA *

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(Concluded from p. 551)

GLIOMAS OF THE CHIASM

Ophthalmologists have long been familiar with the gliomas that involve the optic nerve in its intra-orbital course. Less well known are the tumors of similar type that arise from the chiasm or adjacent wall of the third ventricle, whence they spread forward in some instances even as far as the retinal end of the optic nerve. In a paper written with Paul Martin,[10] several years ago, seven of these cases, most of which had been clinically diagnosed as retrobulbar neuritis, were fully described.

These tumors may cause the typical chiasmal syndrome in question, and as the sella remains unaffected they may therefore be symptomatically indistinguishable from a meningioma; but as a rule, they have certain characterizing features that serve to make the clinical diagnosis probable if not certain.

In the first place, they are largely restricted to childhood and consequently scarcely deserve inclusion in this report. The average age of the eighteen patients in our complete series was only 14 years, and if one should exclude the single example of a man of 56 in whom the clinically unrecognized tumor was found at autopsy,[11] the average age of the patients would be two years lower. The condition, moreover, is often associated (six cases of the eighteen) with evidences of von Recklinghausen's disease (generalized neurofibromatosis).

In the second place, the field defects, though often bitemporal in character, are apt to be bizarre, and hemianopsia with a vertical meridian is rare. The optic atrophy, furthermore, has been found in two cases to be accompanied by a peculiar measurable elevation of the nerve head due apparently to the spread of the glioma down the length of the nerve.

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* An address before the International Ophthalmological Congress, Scheveningen, Sept. 12, 1929. Since its publication in the Transactions of the Congress, this paper has undergone revision, its data have been brought up to date, and an example of a chiasmal glioma in an adult has been added, 9a.

10. Martin and Cushing: Primary Gliomas of the Chiasm and Optic Nerves in Their Intracranial Portion, Arch. Ophth. **52**:209-241 (May) 1923.

11. Martin and Cushing: Footnote 10, case 5.

Another differential point lies in the fact that the sella, though unexpanded, often appears to have a pear-shaped forward expansion under the anterior clinoid processes due to pressure enlargement of the optic foramina. This can be easily demonstrated by direct x-ray exposures of these openings in accordance with the methods described by Schüller, van der Hoeve, de Kleyn and others.

These tumors often come to involve the wall of the third ventricle with the production of hypothalamic symptoms and ultimately of hydrocephalus, but fortunately the lesion may be a slowly progressive one, long unaccompanied by any symptoms other than the loss of vision. The condition can hardly be regarded as surgical, except for the fact that pedunculated outgrowths from the nerves that serve to cause chiasmal pressure may occasionally be found and removed. A surgical exploration may therefore be justified if only precisely to determine what the local condition may be.

In the following case, for example, the clinical diagnosis of chiasmal glioma would have been unquestionable had it not been for the unusually cleancut bitemporal hemianopsia and the presence of two minute flecks of calcification roentgenologically visible just above the tuberculum sellae. These conditions, unusual for a glioma, were considered sufficient to justify an exploration.

CASE 9.—*Progressive failure of vision for three years in a child of 12 with generalized neurofibromatosis. Bitemporal hemianopsia, primary optic atrophy with a normal pituitary fossa and enlarged optic foramina.*

Feb. 19, 1929: Admission of Betty S., 12 years of age, referred by Dr. Joseph Brennemann of Chicago with the diagnosis of probable glioma of the chiasm.

History.—There had been progressive impairment of vision of three years' duration in a child of excellent general health.

Examination.—This showed an intelligent and active girl with unmistakable cutaneous manifestations (fig. 55) of von Recklinghausen's disease in association with multiple neurofibromas of all the palpable peripheral nerves. (The child's father also showed mild cutaneous evidences of the same disorder.)

The optic disks were found to have an atrophic pallor but were otherwise normal. Vision on the left was 20/50, on the right 20/200. The fields, replotted on many occasions, showed a sharply cut bitemporal hemianopsia with a variable remaining zone of vision to large disks in the temporal periphery of the right eye (fig. 50).

The cranial roentgenograms showed a pituitary fossa of normal size (fig. 51) but with the characteristic gourd-shaped extension under the anterior clinoid processes due to wide expansion of the optic foramina (fig. 52). There were no recognizable hypothalamic symptoms such as polyuria, hypersomnia, adiposity or personality changes. The basal metabolic rate was —19 per cent, suggesting some secondary pituitary involvement.

Operation.—On *March 4, 1929,* the region of the optic nerves and chiasm was found to be occupied by a symmetrically disposed bulging mass vascularized by a few fine surface vessels (fig. 53). The presence of a slight central groove was all that remained to show the original cleft between right and left nerves.

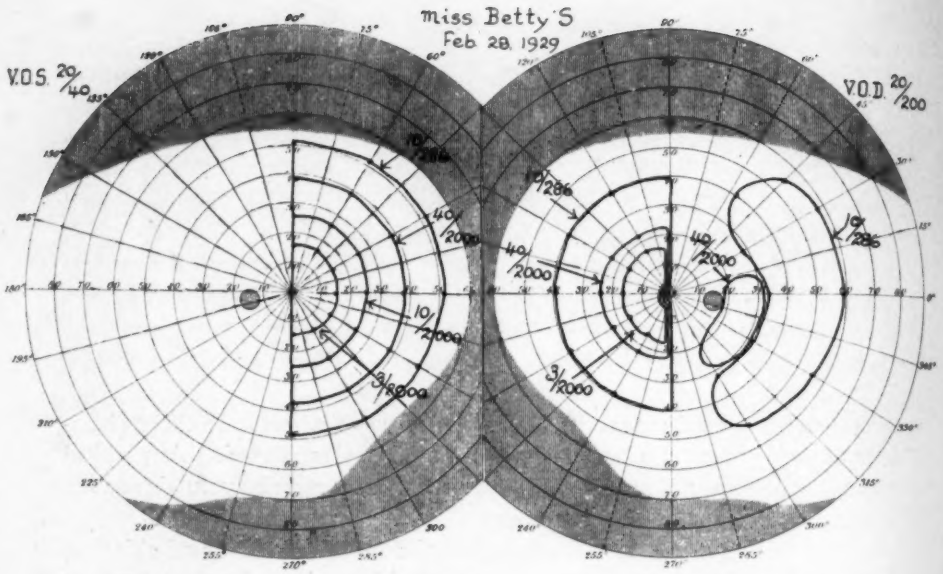

Fig. 50 (case 9).—The visual fields (screen and perimeter) in a case of chiasmal glioma showing bitemporal field defects with unusually sharp vertical meridians for this type of lesion.

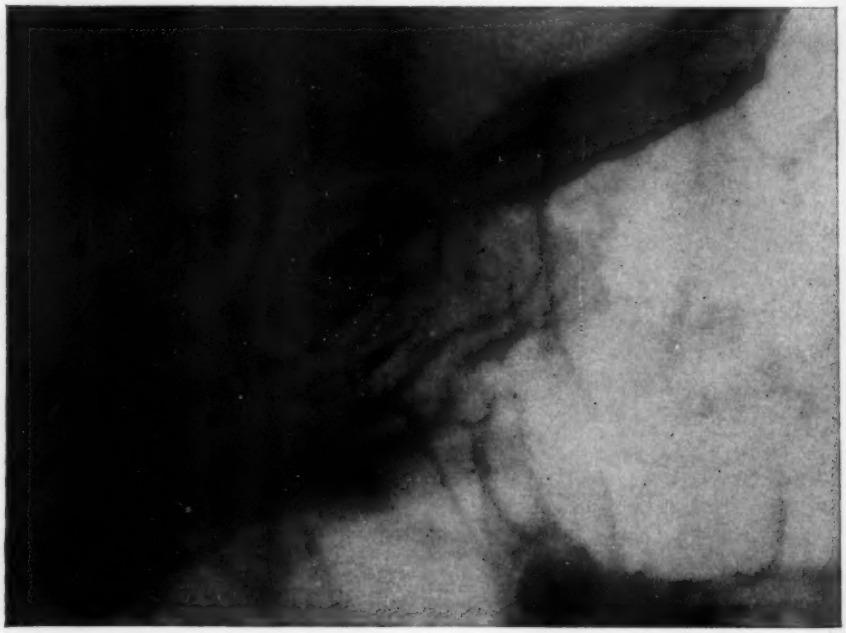

Fig. 51 (case 9).—Showing the profile view of a normal sella with a characteristic apparent expansion of the fossa under the anterior clinoids. Film taken after operation to show position of silver clip (cf. fig. 53).

A silver clip was put on the anterior capsule of the growth for subsequent orientation of the relative position of sella and dilated optic foramina (fig. 51).

Subsequent Notes.—The child made a perfect recovery and was discharged eighteen days after operation (fig. 54), with condition unchanged. She was subsequently given a series of x-ray treatments, with no apparent benefit. There had been no appreciable advance in the process to *March, 1930.*[12]

This, then, was a clinically nigh unmistakable glioma of the chiasm in a child. A lesion of the same sort may occasionally occur in an adult when, in the absence of a tell-tale neurofibromatosis or of dilated optic foramina, it may be difficult or impossible clinically to distinguish

Fig. 52 (case 9).—Showing (natural size) the anterior half of the greatly dilated optic foramen (arrows) on oblique view of the orbit.

the growth from a suprasellar adenoma or meningioma. An example of such a case, recently coming under observation, may deserve incorporation in this report as follows:

CASE 9a.—*Progressive failure of vision for nine months in a tall young adult having coincidental polyuria. Primary optic atrophy with homonymous field defects in association with a normal sella and normal optic foramina.*

12. In evidence of the slowly progressive, or even stationary, course of many of these gliomas, it may be stated that the condition in case 7 of the report by Martin and Cushing (*loc. cit.*) remains essentially unchanged after an interval of seven years, the patient now being 27 years of age.

Jan. 11, 1930: Admission of Bailey D., a rural school teacher, 23 years of age, on the recommendation of Dr. E. C. Goar of Houston, Texas, through Dr. G. S. Derby.

History.—For nine months there had been a progressive and unaccountable impairment of vision beginning as a central scotoma in the left eye and extending to the other where temporal blindness was subjectively apparent. Accompanying these changes and possibly preceding them the patient had become aware of some polydipsia with polyuria. There also had been some frontal headache after prolonged use of the eyes. For a few months past, he was conscious of becoming easily fatigued. He had recently been losing weight.

Examination.—This showed an intelligent and cooperative young man with large extremities who was unusually tall (6 ft., 4 in. [193.6 cm.]), slim (140 pounds [63.5 Kg.]), and comparatively beardless, his appearance strongly suggesting a mixed hypophysial syndrome, possibly "fugitive hyperpituitarism." The optic disks had the pallor of advanced atrophy; vision in the left eye was reduced to light perception; in the right eye it was 20/30. The fields of vision

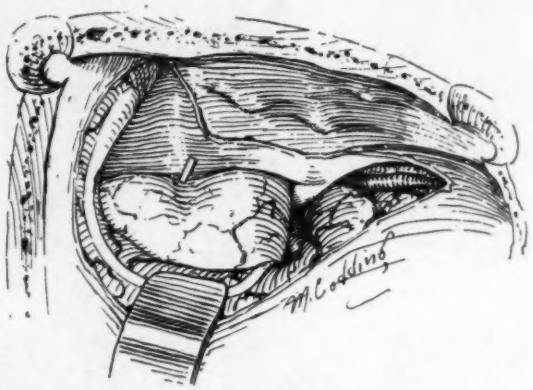

Fig. 53 (case 9).—Operative sketch showing the massive and fused symmetrical tumefaction of the optic nerves from a chiasmal glioma associated with von Recklinghausen's disease in a child 12 years of age.

showed (fig. 56) a sharply cut temporal hemianopsia on the right, and on the left there was a patch of retained vision for movements of objects in the upper temporal field. The condition suggested the residual of a right homonymous hemianopsia. The x-rays showed (fig. 57) a sella of normal appearance with no regional calcification. There was no enlargement of the optic foramina. There was a constant polyuria and polydipsia of about 4 liters daily. The blood pressure was low, 110 systolic and 60 diastolic; the basal metabolic rate was —13 per cent.

Presumptive Diagnosis.—In view of the patient's physical appearance, unusual stature, smooth dry skin and lack of body hair, it was anticipated that a suprasellar adenoma (possibly chromophilic) would be found presenting chiefly under the left optic nerve and compressing the anterior third ventricle.

Operation.—On *Feb. 4, 1930,* in the course of the customary transfrontal exploration which was conducted under local anesthesia, a greatly tumefied chiasm was readily exposed (fig. 58). The thickening chiefly involved the left side of the structure, and only the stump of the left nerve remained unaffected. The

Figure 54

Figure 55

Fig. 54 (case 9).—Patient on discharge from hospital, to show the reactionless healing of wound.

Fig. 55 (case 9).—To show the cutaneous evidences of von Recklinghausen's disease: patches of pigmentation and subcutaneous neurofibromatosis.

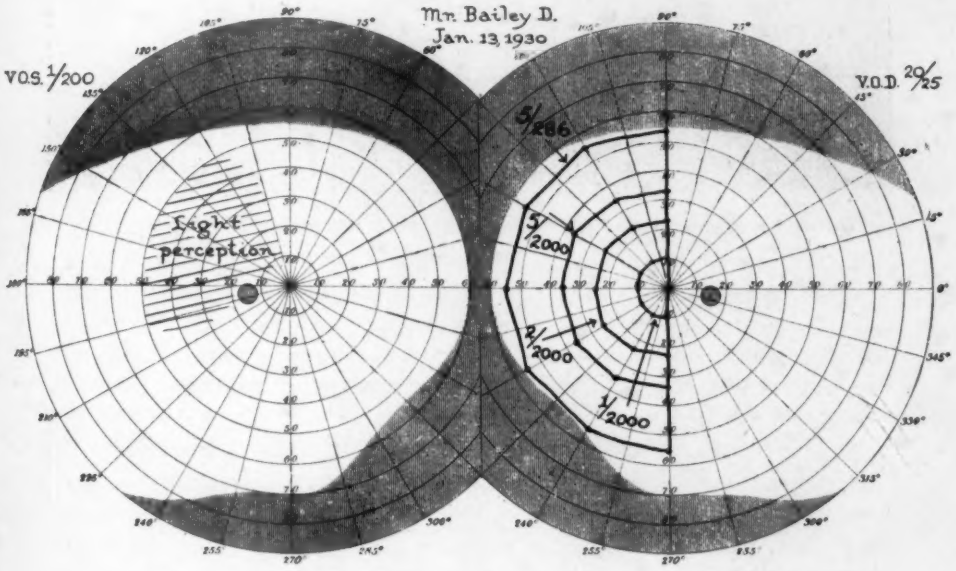

Fig. 56 (case 9a).—Fields on admission of patient with proved glioma of chiasm; right homonymous hemianopsia (?).

right nerve was less involved, and that portion of it representing the uncrossed fibers alone was of normal color and appearance. The exposure of the lesion was not pressed further than shown in the sketch, but nevertheless there was a temporary increase in the polyuria for a few days after the operation, the intake amounting to about 8 liters. Under posterior pituitary extract (vasopressin), this promptly subsided. The patient, who otherwise made an uneventful recovery from the exploration, was given a series of x-ray treatments and was discharged on *February 25.*

Comment.—This case therefore completely misled us, and the diagnosis of glioma was not even considered in the preoperative discussion

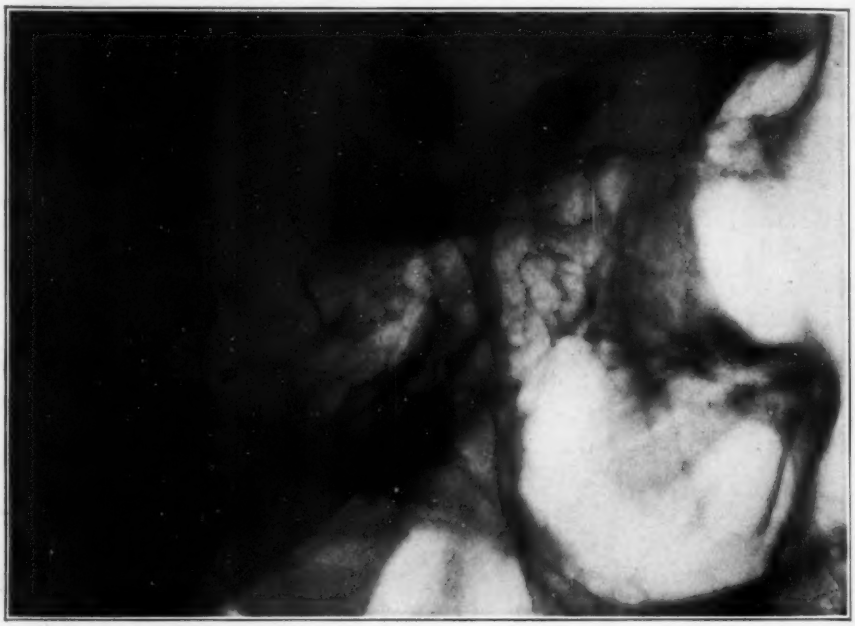

Fig. 57 (case 9a).—Normal sella of patient with glioma of chiasm.

of the presumable cause of the chiasmal syndrome. In view of the operative findings, it is curious that any of the crossed fibers to the left eye should have escaped destruction, but this was true also of the right eye in case 9 (cf. fig. 50). The fact that in diffuse tumors of this sort the sharply cut vertical hemianopsia, present in both these cases, is at all possible probably is due to the actual gross anatomic separation of the crossed and uncrossed bundles. This ready separability of the two bundles is not infrequently demonstrated in operations for pituitary adenomas, by the tendency of a tumor nodule actually to protrude through from below between the two bundles.

SUPRASELLAR ANEURYSMS

Intracranial aneurysms, even those which arise from the internal carotid or Willisian circle, are apt to be comparatively silent lesions until they happen to rupture. Most of them are small, pea-sized lesions, and they may occur in the young or old. Rupture usually causes a characteristic syndrome of sudden extreme cephalalgia often followed by unconsciousness, bloody cerebrospinal fluid being disclosed by a lumbar puncture. Should the patient recover, a unilateral palsy of the oculomotorius with numbness in the upper trigeminal skin field is a common sequel of the accident.

Larger, saccular aneurysms of the basilar system of ateries are not uncommon in older people, and may give symptoms difficult to distinguish from tumor, particularly as they rarely have an audible bruit.

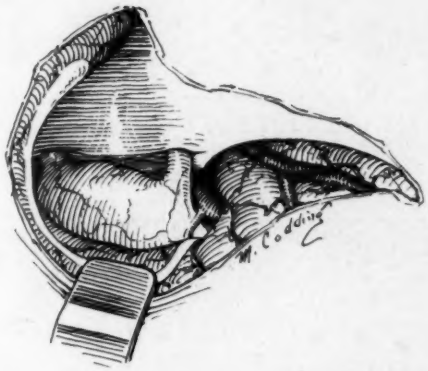

Fig. 58 (case 9a).—Operative sketch showing tumefaction of chiasmal glioma leaving stumps of nerves uninvolved and optic foramina consequently found to be unenlarged.

Occasionally such aneurysms, because of a chiasmal syndrome suggesting a suprasellar tumor, may be unexpectedly exposed at operation. The following case is an example:

CASE 10.—*Progressive failure of vision for eighteen months in a middle-aged woman. Primary optic atrophy with blindness in one eye and temporal hemianopsia in the other. Unexpanded though atrophic sella. Favored diagnosis, suprasellar meningioma. Operation disclosing cystic parasellar tumor shown to be aneurysm by puncture. Fatal rupture eight months later.*

July 10, 1926: Admission of Miss Margaret G., 50 years of age, referred to the hospital by Dr. G. S. Derby with the diagnosis of presumable suprasellar tumor.

History.—A hard-working woman, for many years the mainstay of her family, she had been obliged to relinquish her position as an insurance agent owing to progressive impairment of sight. This was first noticed in the right eye eighteen months previously, and it was not known whether the disturbance had begun as

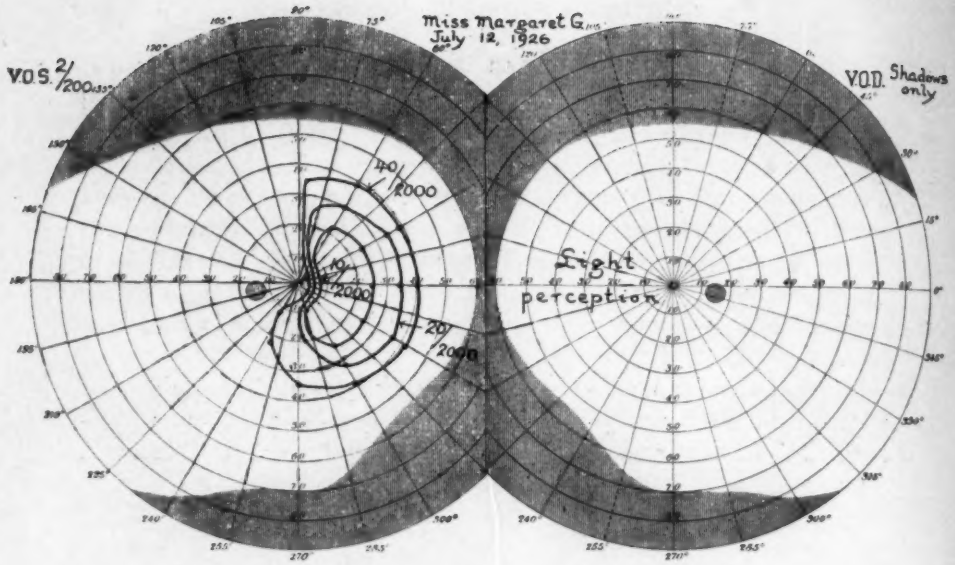

Fig. 59 (case 10).—The fields (screen method only), on admission, of a patient with presumed meningioma found to have a right parasellar aneurysm.

Fig. 60 (case 10).—Sella of patient with suprasellar aneurysm and a chiasmal syndrome.

a temporal or a nasal field defect. She had been subjected in the interval to intranasal operations, to the extraction of teeth, and to a course of antisyphilitic treatment.

Examination.—The examination on admission showed bilateral optic atrophy with bare light perception in the right eye and a temporal hemianopsia in the left, in which vision was reduced to 2/200 (fig. 59). The retained light perception in the right eye appeared to several observers to be in the nasal field, making an original bitemporal rather than an homonymous field defect probable. The sella (fig. 60), though of normal size, showed atrophy with erosion of the anterior clinoid processes. There were no secondary pituitary symptoms; her basal metabolic rate was +9 per cent. There was a moderate vascular hypertension (166 systolic over 100 diastolic), and there was slight arteriosclerosis but none visible in the retinal arteries. There was no audible intracranial bruit. The Wassermann reaction was negative.

A diagnosis of probable suprasellar meningioma was made.

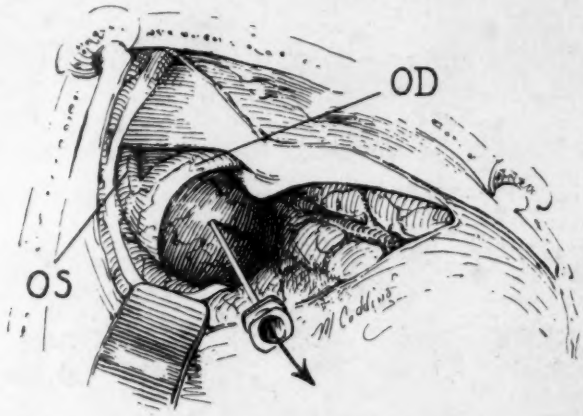

Fig. 61 (case 10).—Operative sketch showing the partly subchiasmal aneurysm causing blindness in the right eye and temporal hemianopsia in the left.

Operation.—At the operation on *July 17,* a spherical tumor about 2 cm. in diameter was found pushing the chiasm and right optic nerve to the left (fig. 61). The tumor, though tense and thick-walled, was not visibly pulsating, and to exclude the possibility of a cyst a fine lumbar puncture needle was inserted into it, whereupon bright arterial blood spurted from the lumen. On withdrawal of the needle, bleeding was easily controlled by the implantation of a small muscle-stamp before the frontal lobe was allowed to fall back in place.

Recovery from the operation was uneventful (fig. 62), and was accompanied by an unexpected and unaccountable subjective improvement in acuity in the left eye. She was discharged on *August 6,* and reported for examination a month later with vision of 20/50 in the left eye; after another month's interval (*October 14*), it had improved to 20/40. Meanwhile, the field in the left eye showed an unexpected expansion (fig. 63).

She resumed her previous occupation as an insurance agent, and wrote periodically to say that she was in excellent health and spirits with sufficient vision to carry on her work. On *March 29, 1927,* eight months after the operation, she

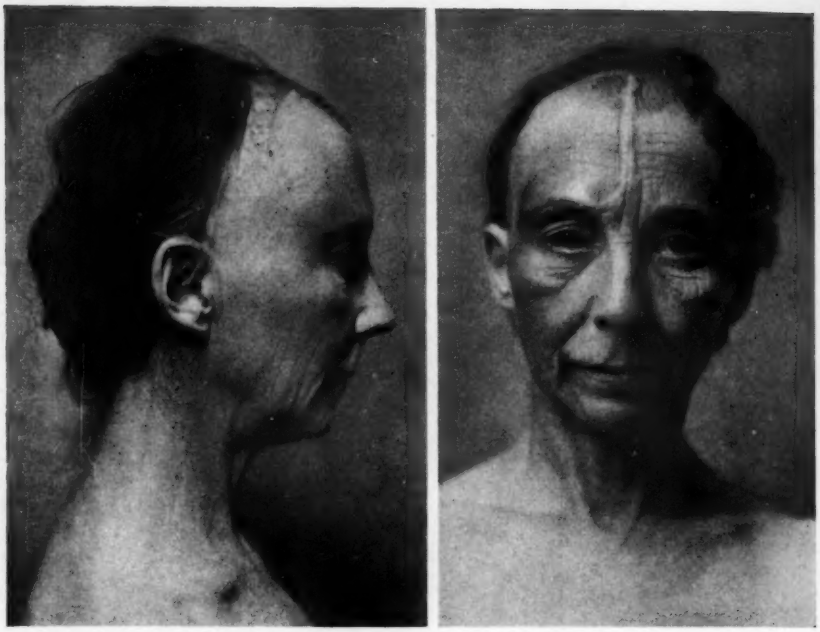

Fig. 62 (case 10).—The patient two weeks after a transfrontal exploration revealing an aneurysm.

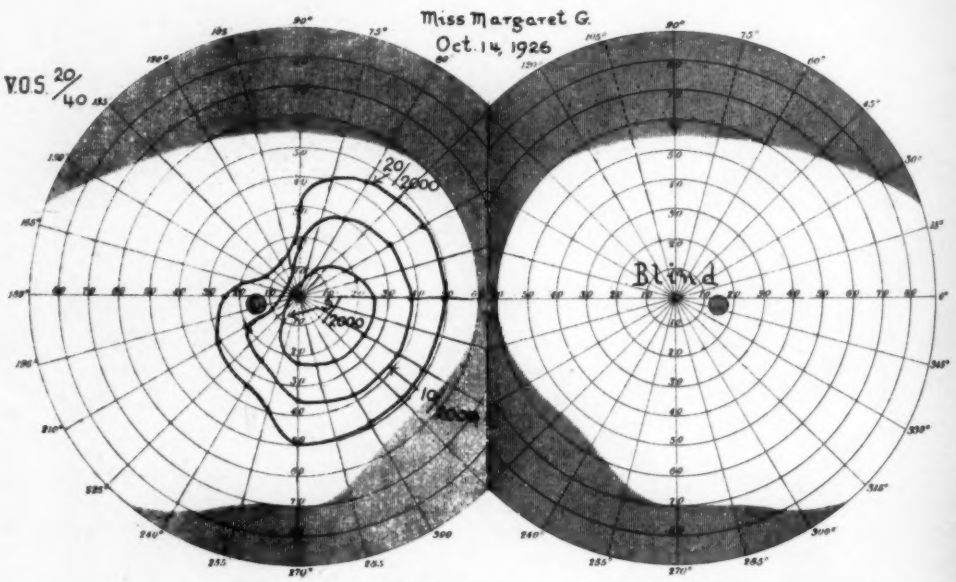

Fig. 63 (case10).—Patient's fields (screen method only) showing unexpected improvement three months after operation revealing a suprasellar aneurysm (cf. fig. 59).

was reported to have had a sudden violent pain in the head followed by vomiting, unconsciousness and death in a few hours. There was no postmortem examination.

Comment.—The situation of the lesion in this case as disclosed at operation would certainly have led one to presuppose that the field defects in the right eye must have begun as a nasal hemianopsia and have progressed homonymously, but records have been secured from Dr. I. J. Koenig who saw the patient early in 1925, at which time the temporal field in the left eye alone was affected. The slight postoperative improvement in vision that was observed cannot be ascribed to anything that was done at the operation. A patient with a supra-

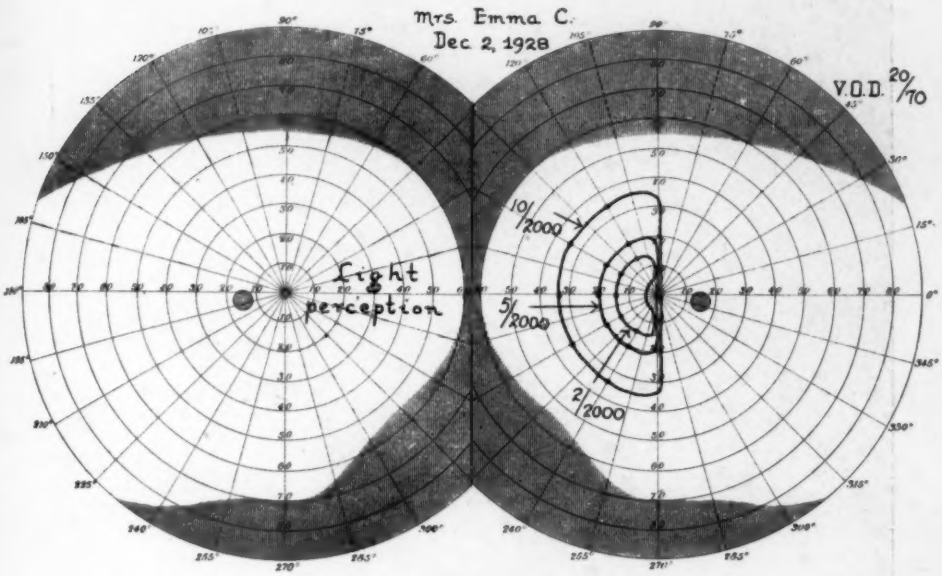

Fig. 64 (case 11).—Fields on admission (screen method only) of a case of proved suprasellar aneurysm.

sellar aneurysm whose case has recently been reported by S. Taylor Harris [13] had a spontaneous return of vision after having been "quite blind" for a few weeks; the patient died suddenly from aneurysmal rupture while under observation.

The account of another aneurysm mesially situated and producing a chiasmal syndrome follows.

CASE 11.—*Progressive failure of vision for 2.5 years in a woman of advancing age. Primary atrophy and bitemporal blindness with an atrophic though unexpanded sella turcica. Favored diagnosis, suprasellar meningioma. Operation disclosing suprasellar aneurysm.*

13. Harris, S. T.: Aneurysm of the Anterior Cerebral Artery Causing Compression of the Optic Nerves and Chiasm, Brit. J. Ophth. **12**:16-22, 1928.

Nov. 23, 1929: Admission of Mrs. Emma C., 58 years of age, referred to the clinic as presumably having a pituitary tumor by Dr. Henry F. Stoll of Hartford, Connecticut.

Clinical History.—Following some domestic infelicity in the spring of 1926, the patient, previously in good health, began to suffer from insomnia and nervousness associated with morning headaches which were relieved by acetylsalicylic acid. Soon after this, she began to lose temporal vision in the left eye, and this slowly progressed to near-blindness. About four months ago, the right eye began to be similarly affected with loss of temporal vision. At one time she had a

Fig. 65 (case 11).—Showing sella of essentially normal contour with pointed and atrophic dorsum sellae and pointed anterior clinoid processes in a case of suprasellar aneurysms. (The shadows within the fossa are from a ridge in the distant temporal bone.)

transient period of mild diplopia. There was a suggestive history of polydipsia and polyuria, which was not clinically corroborated.

Examination.—Examination showed a frail, undernourished woman (53.3 Kg.) of advanced middle age with no physical derangement apart from a moderate vascular hypertension; systolic, 175; diastolic, 100. The localizing symptomatology consisted of: (1) a primary optic atrophy with pearly white disks and slight arteriosclerosis of the retinal vessels; (2) bitemporal blindness with typical meridional hemianopsia on the right (fig. 64); vision in the left eye reduced to nasal perception of light and in the right eye to 20/70 corrected; (3) a normal and undeformed sella (fig. 65) with slightly sharpened anterior clinoid processes

and thinning of the dorsum. The basal metabolic rate was in normal limits, —9 per cent; the olfactory sense was unaffected; there were no recognizable secondary hypothalamic or pituitary symptoms. A supposedly normal menopause had occurred at 41 years of age.

Clinical Diagnosis.—A suprasellar meningioma was favored. Aneurysm was not seriously considered in spite of the moderate hypertension. There was no subjective bruit, and none was heard on auscultation of the head.

Operation.—On *Dec. 14, 1928,* under local anesthesia, the usual right osteoplastic flap was elevated without incident other than an unaccountable fall in blood pressure from 170 systolic and 100 diastolic to 55 systolic and 35 diastolic. On

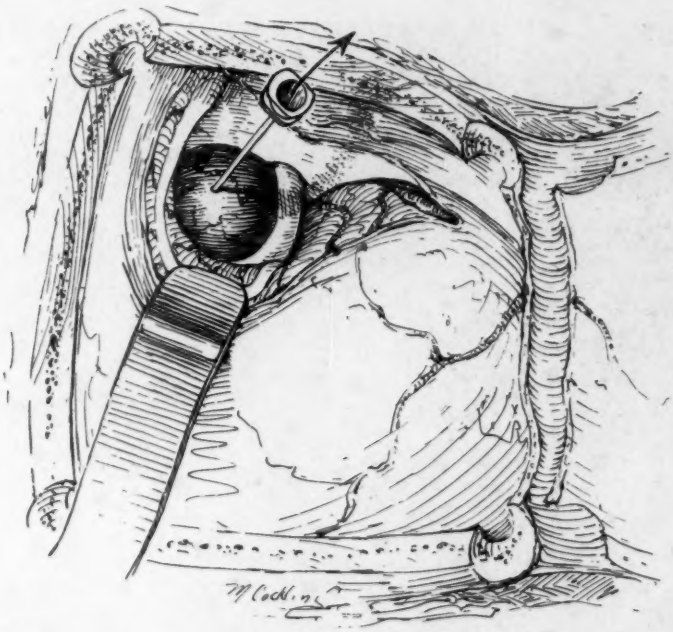

Fig. 66 (case 11).—Sketch of field of operation showing mesially placed suprasellar aneurysm mistaken for adenoma until punctured.

exposing the suprasellar region, a bulging median tumor presented in the anterior crotch of the chiasm (fig. 66) widely separating the nerves. It was taken to be a suprasellar adenoma and by good fortune was not immediately incised. With the idea that it might be a cystic adenoma, a lumbar puncture needle was put into it, and bright arterial blood spurted from the lumen. On withdrawing the needle, a small muscle-stamp was immediately placed on the bleeding point and held until it adhered. After the usual painstaking hemostasis, the flap was replaced and the wound closed.

Postoperative Notes.—The patient had a somewhat stormy convalescence. There was a good deal of ecchymosis of the eyes, and at one time it was feared that an extradural clot might have formed. She ultimately made a good operative recovery (fig. 67) and was discharged on *Feb. 1, 1929,* with her local symptoms

unchanged. Curiously enough, her hypertension was less marked than at entrance, averaging 140 systolic and 70 diastolic.

Subsequent Notes.—When last heard from, on *Feb. 21, 1930,* her condition remained essentially unaltered.

Comment.—In spite of this woman's moderate hypertension, a diagnosis could hardly have been made without bringing the lesion into view. Even so, in the absence of visible pulsation, the true nature of the "tumor" was determined only by tapping it. From just what branch of the circle the aneurysm actually took its origin is problematic,

Fig. 67 (case 11).—Patient on discharge after transfrontal exploration for chiasmal syndrome, disclosing suprasellar aneurysm.

but in view of its position beneath the chiasm, it probably arose from the posterior communicating artery on the side of primary blindness. However, if this is true, it is surprising that no hypothalamic symptoms were produced.

Without surgical exploration the diagnosis of aneurysm must often remain in doubt. This, for example, is true of the following case, in which operation has been withheld on the grounds that aneurysm was the most probable cause of the syndrome.

CASE 12.—*Typical chiasmal syndrome with bitemporal field defects, optic atrophy and a normal sella in a man of early middle age with hypertension and a*

previous history suggesting leakage from an aneurysm. Exploration regarded as inadvisable.

June 11, 1929: Admission of Mr. C., 40 years of age, referred indirectly to the clinic by an ophthalmologist as presumably having a suprasellar tumor.

History.—A man of general excellent health, in *March, 1927,* had a sudden severe attack of headache followed by unconsciousness and slow recovery. Three weeks later, while at stool, he had a second abrupt attack of the same nature, and a lumbar puncture showed bloody cerebrospinal fluid. There were no subsequent ophthalmologic symptoms. From this attack he made a slow recovery, but was inclined to have morning headaches. He was known to have familial hypertension.

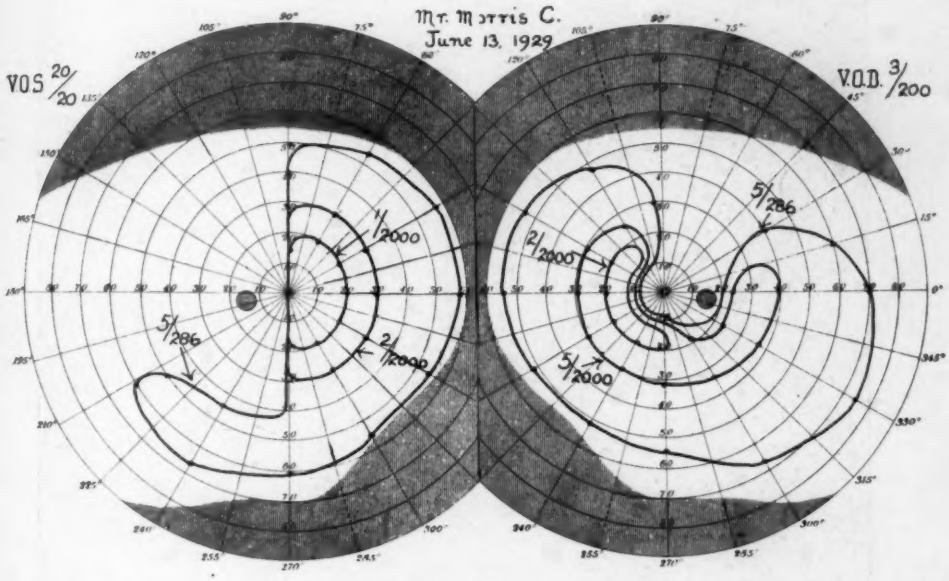

Fig. 68 (case 12).—The fields (to perimeter and screen), on admission, of a patient with hypertension and presumed aneurysm.

A year passed without further symptoms until *June, 1928,* when his vision became blurred in the right eye, and he was found to have a central scotoma. By *January, 1929,* the vision in the right eye had dropped to 20/200, and the left eye had begun to be affected. He subsequently was subjected to several radical intranasal procedures with opening and drainage of the accessory nasal sinuses, ethmoids, sphenoids and antrums. These procedures did not favorably affect his vision, and he has since had a more or less continuous nasal discharge. In May, a temporal field defect was demonstrated in the left eye.

Examination.—The examination on admission showed: (1) a moderate pallor of both optic nerves; (2) bitemporal field defects (fig. 68), and an absolutely unaffected sella (fig. 69). In addition there was a vascular hypertension of 200 systolic and 140 diastolic, and a dilated left internal carotid over which a bruit was easily detected at the angle of the jaw, and the retinal arteries were suspiciously large and tortuous. The Wassermann reaction was negative.

Comment.—Owing to the diagnosis of presumable aneurysm, an exploration was considered inadvisable, though it was urged by others on the grounds that tumor and vascular hypertension might well enough occur in the same person. There was, to be sure, something to be said in favor of this view, more particularly (1) because of the evident median position of the lesion with symmetrical bitemporal field involvement rarely seen in aneurysm, and (2) because of the absence of any pressure erosion of the sella such as was present in the two previous cases with proved aneurysm.

Fig. 69 (case 12).—The sella of a patient with a chiasmal syndrome attributed to a suprasellar aneurysm.

The foregoing admission serves again to emphasize the fact that without direct exposure of the lesion, the differential diagnosis may be impossible. But certainly the history, the marked hypertension, and the enlarged carotid with its audible bruit certify the existence of arterial disease, and this strongly supports the diagnosis of an aneurysm as the most probable cause of the chiasmal syndrome in this case.

General Comments on Aneurysm.—One would suppose that the presence of an intracranial aneurysm of the saccular type would invariably be betrayed by auscultation of the skull. Curiously enough, sacculated aneurysms as large as those shown in figures 61 and 66 are without audible sound. On only two or three occasions in our considerable series of intracranial aneurysms has a bruit been audible both

to patient and observer. Other vascular intracranial lesions such as arteriovenous aneurysms, angiomatous malformations, and vascular tumors of various sorts, as is well known, may produce a loud, machinery bruit, but, for some unaccountable reason, the type of intracranial aneurysm that supposedly would be most likely to produce a bruit fails to do so.

That an aneurysm should chance to be so situated as to stimulate a median suprasellar lesion can scarcely be a common happening. Moreover, since an aneurysm is apt to cause pressure erosion when situated in the vicinity of bone, one would expect even more marked changes in the sella than were shown in figures 60 and 65, and yet in the sella of this third (unproved) case of aneurysm there was no sellar atrophy, far less any actual erosion.[14]

Whether some form of obliterative procedure could be safely undertaken when one of these lesions is unexpectedly exposed, as it was in cases 10 and 11, is a matter for the surgeon rather than the ophthalmologist. On one occasion when a supposed intracerebral cyst was tapped with a large-sized needle and found to be an aneurysm, fine strips of fresh muscle, fortunately at hand for purposes of hemostasis, were fed in through the puncture opening until it became occluded from the inside. It is quite possible that the sac might have been safely filled in this way and have subsequently become solidified by clot. Ligation of the internal carotid in the neck for an aneurysm in the region of the circle of Willis is futile, inasmuch as the lesion is equally well fed from both sides. Should such a ligation chance to affect the aneurysm favorably, it would at the same time and for the same reasons in an elderly person be almost certain to cut off the circulation from the hemisphere and cause a contralateral hemiplegia.

CHORDOMA WITH SUPRASELLAR SYNDROME

Among our patients who have had transfrontal explorations for a chiasmal syndrome, there is one in whom the symptoms were produced by a tumor almost too rare to deserve consideration in a differential diagnosis. Out of our series of over 1,800 histologically verified tumors, only 3 chordomas have been positively identified.[15] Conse-

14. Since these paragraphs were written, a woman (surg. no. 34343) 48 years of age with a perfectly typical, uncomplicated suprasellar syndrome in the absence of any recognizable arteriosclerosis or hypertension has been operated on with full expectation of finding a meningioma, but a median subchiasmal aneurysm was disclosed. In this case the optic nerve, which was nearly blind, was divided at the foramen in order to relieve tension on the chiasm with subsequent temporary improvement in vision in the other eye.

15. Two of these cases have been reported by Drs. Bailey and Bagdasar largely from a histopathologic standpoint. (Intracranial Chordoblastoma: Am. J. Path. **5**:439-449, 1929).

quently to make a correct preoperative diagnosis of one of these lesions at an early stage need hardly be expected. The clinical history of the case is briefly as follows:

CASE 13.—*Progressive bitemporal loss of vision with primary optic atrophy in a woman of 34 with a normal sella. Recent amenorrhea and some mental instability. A retrochiasmal growth mistaken at operation for an adenoma. The extirpated nodule proved to be a chordoblastoma.*

Jan. 4, 1928: Admission of Mrs. R. S., a Jewess 34 years of age, on the recommendation of Dr. A. M. Goldman of New York for headaches and progessive loss of vision.

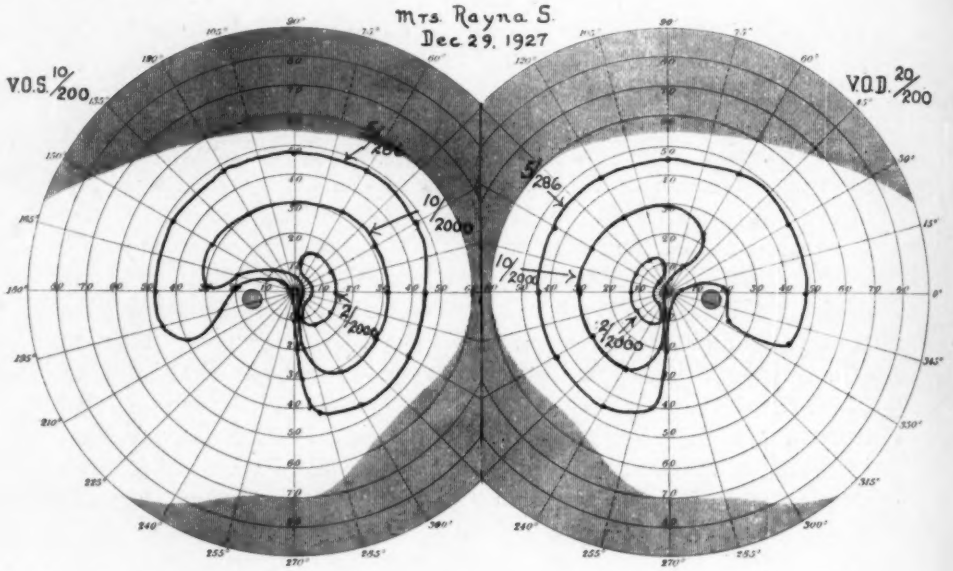

Fig. 70 (case 13).—The fields (to screen and perimeter) on patient's admission showing the form of bitemporal defect in which an enlarging temporal scotoma breaks through below (cf. figs. 47 and 48).

History.—The patient, a socialy inclined woman, one of two sisters, had enjoyed reasonably good health apart from periodic headaches for many years. Though once pregnant, she had had no children, and in 1916 a pelvic laparotomy was performed with the removal of an ovary. Failure of vision had been observed for three months. The progressive field defects were known to have begun with a temporal hemiachromatopsia followed by loss of vision in the lower bitemporal quadrants.

Examination.—The patient was a cooperative, intelligent and well nourished woman whose physical examination proved negative in all respects apart from the ophthalmologic findings. The fundi showed early pallor of the nerves with no other change. Visual acuity was reduced to about 20/200 in each eye. There was an incomplete lower field bitemporal hemianopsia (fig. 70). The sella was

normal (fig. 71). She was slightly overweight, having gained 38 pounds (17.2 Kg.) in the past few years, and the basal metabolic rate was —12 per cent. She had a low blood pressure: 108 systolic and 68 diastolic.

Preoperative Diagnosis.—A suprasellar meningioma was favored in spite of the unusual field defects which were taken to indicate median pressure against the chiasm from above rather than from below. Adenoma was considered possible.

Operation.—On *Jan. 14, 1928,* a short-legged and anteriorly placed chiasm was disclosed without evidence of tumor. Not until the nerves had been so completely freed from their arachnoid attachments that full exposure of the posterior chiasm, beyond the anterior cerebral artery, was possible, did a retrochiasmal bulging

Fig. 71 (case 13).—Showing the somewhat atrophic but otherwise normal sella in a case of suprasellar chordoma.

tumor nodule come into view, covered by thinned-out strands of nerve tissue (fig. 72). After its exposure, this tumor nodule was mistaken for an adenoma because of its appearance and consistency. It was incised, and a mass of tissue about 1.5 cm. in diameter was scooped out with a pituitary spoon. There was practically no bleeding.

Pathology.—The nodule proved (fig. 73) to be a typical chordoma.

Subsequent Course.—Recovery from the operation was uneventful, with the customary perfect healing. There was some widening of the fields with marked improvement in acuity (fig. 74), particularly on the left, where she had regained considerable acuity of vision (from 10/200 to 20/70) before her discharge on *Jan. 30, 1928.* She was subsequently given a series of x-ray treatments. When last examined on *June 3,* the condition of the fields was essentially stationary (fig. 74).

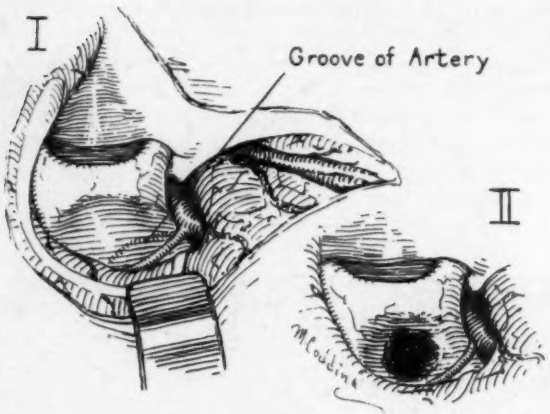

Fig. 72 (case 13).—Operative sketch showing: *I*, a somewhat prefixed chiasm with tumor bulging under its posterior portion; *II*, partial extirpation of tumor.

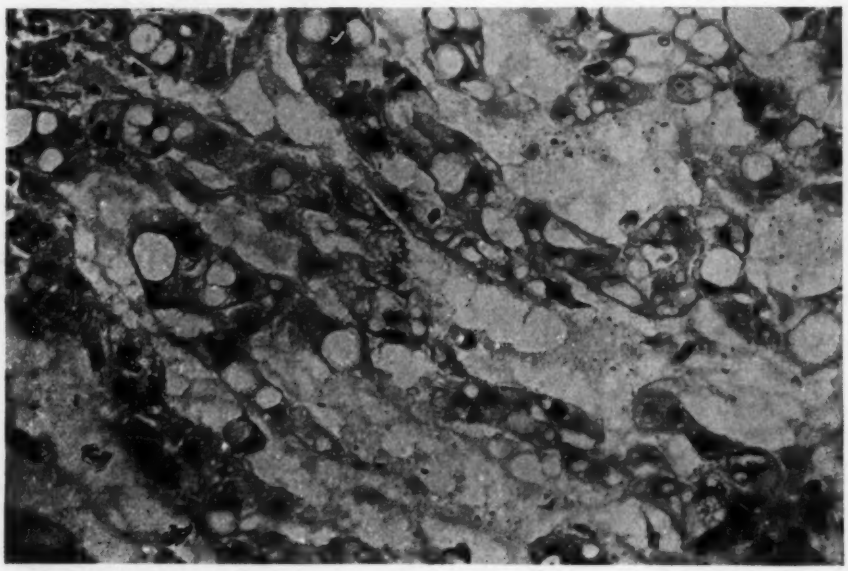

Fig. 73 (case 13).—Photomicrograph of tumor (chordoma) producing a suprasellar syndrome. Methylene blue-eosin; × 300.

Comment.—The interest in this case, apart from the pathologic rarity of the tumor, lies in the peculiarity that the early bitemporal defects involved the lower rather than the upper quadrants. The usual median tumor that presses against the chiasm from below (like the adenomas, whether they are primarily intrasellar or suprasellar, and the same is true of the majority of craniopharyngiomas) begins in typical cases to show its primary pressure effects by a partial eclipse of the upper temporal quadrants, whence the defects progress downward. On the other hand, after relief from pressure resulting in a retro-

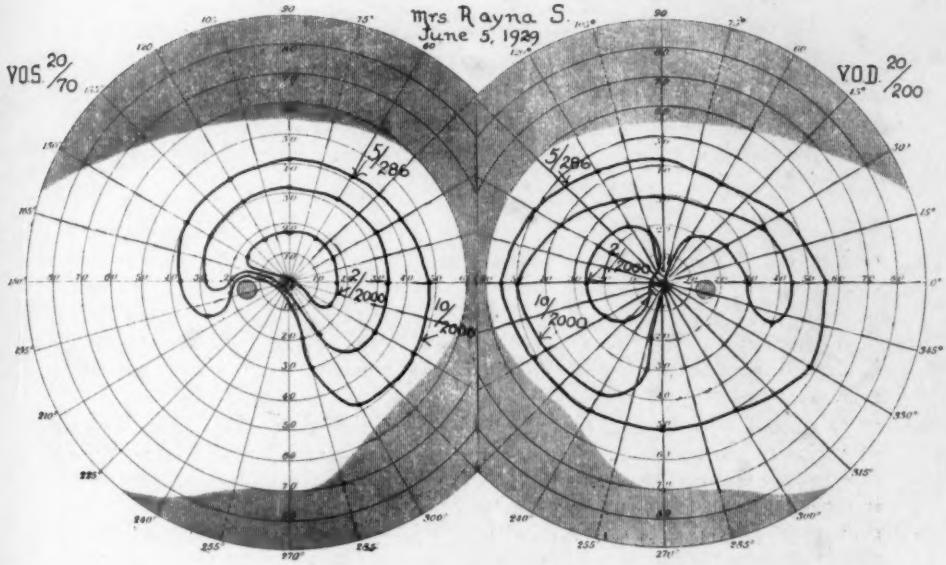

Fig. 74 (case 13).—Fields four months after operation (same test objects as fig. 70) showing some widening of peripheries on the left.

gression in the blind areas, the constricted fields gradually widen out in the reverse direction, namely, from below upward.

To be sure, only a few examples of fields of this more usual type happen to be represented in the cases discussed in this paper, though the fields in case 5 (figs. 29 and 32), one of adenoma, show this characteristic deformation. However, in case 5, as may be observed, the tumor lay anterior to the chiasm, so that pressure against the lower crossed bundles in the optic nerves themselves may possibly have accounted for the field defects.

In this case 13, on the contrary, the tumor was retrochiasmal, and it is conceivable that the unusual field defects, which are reminiscent of those shown in figures 47 and 48, from another partly retrochiasmal

tumor, are attributable to pressure from above on the crossed bundles as they lie in the optic tracts, but this of course is purely conjectural. The only point to be emphasized is that in the production of a chiasmal symdrome the block to visual impulses producing the bitemporal hemianopsia need not necessarily be restricted to the bundles as they pass across the chiasm. For in the case of posteriorly placed tumors, the effect may be produced by pressure involvement of these same bundles in the optic tracts just as in anteriorly placed tumors it may be the crossed bundles in the nerves themselves that suffer.

THE CHIASMAL SYNDROME IN THE ABSENCE OF TUMOR

There remains for discussion one further group of cases; namely, those adults with a presumed suprasellar syndrome and a normal sella in whom at operation the findings have been quite negative apart from an excess of fluid and apparent thickening of the walls of the cisterna chiasmatis. Of this chiasmal pseudotumor syndrome, the following recent case is a fair example.

CASE 14.—*Slowly progressive failure of vision for three years with optic atrophy, bitemporal field defects and large central scotomas in a man nearing middle age. Exploration negative apart from thickened arachnoid. No postoperative improvement.*

May 22, 1929: Admission of C. E. M., a banker, 39 years of age, referred by Dr. William H. Stokes of Dallas, Texas, with the diagnosis of probable suprasellar tumor.

History.—The patient, a vigorous man of excellent health, first became aware of haziness of temporal and central vision in the left eye in 1926. In this eye there was progressive loss of vision for the next two years or more, but sight in the other eye remained unaffected until *January, 1929,* when it also began to be similarly obscured. He first consulted Dr. Stokes on *April 5, 1929,* at which time a complete left temporal hemianopsia and a defect for colors in the upper temporal quadrant in the right eye suggested the presence of a suprasellar tumor.

The patient, however, had a history of a possible juvenile, untreated syphilitic infection, and, though the blood Wassermann test was negative, the lumbar cerebrospinal fluid showed a suspicious trace of globulin with 7 cells and slightly positive Wassermann and Kahn reactions. He accordingly was put on a vigorous antisyphilitic régime for a month, at the end of which brief time the Wassermann and Kahn reactions were found negative, making the diagnosis of syphilis doubtful. Meanwhile the patient's sight had progressively failed, and in the hope that the symptoms might after all be due to tumor, an exploratory operation was advised.

Examination.—This was wholly negative apart from the ophthalmologic findings. The sella was normal (fig. 75). The optic disks were sharply outlined and showed a grayish atrophy. Vision in the left eye was 2/200; in the right eye 20/50. The fields when first taken disclosed a definite obscuration of vision to all test objects in the right temporal field, and in the left eye an equally extensive temporal involvement with a large central scotoma.

Though the patient was most cooperative, the fields, frequently taken, were found to be variable from day to day and difficult quantitatively to plot with accuracy,

particularly on the left, owing to the impaired fixation. During the ten days while the patient had been kept under observation, vision in the right eye rapidly deteriorated owing to the progression of a macular scotoma. The fields of *May 30* (fig. 76) were carefully charted by Dr. Clifford B. Walker, who happened to be visiting the clinic at the time.

The diagnosis was debatable, but the possibility of meningioma could not be denied.

Operation.—On *June 1, 1929,* in the course of the usual osteoplastic exploration, wholly under local anesthesia, a postfixed chiasm was disclosed (fig. 77) enveloped in a distinctly thickened and grayish arachnoid containing a great excess of fluid. After the complete withdrawal of the fluid by suction, a deep, subchiasmal pocket was left, in the base of which lay the pinkish upper surface

Fig. 75 (case 14).—Showing the sharply cut normal sella in an adult with a pseudotumor chiasmal syndrome.

of the flattened hypophysis surrounded by the circle of dark, willisian dural venous sinuses showing through a thin, overlying diaphragm. Emerging from its aperature in the posterior part of the diaphragm could be seen the flattened infundibular stalk.

The patient made a perfect recovery from this exploration, but there was no improvement in vision.

Comment.—The fields shown in figure 76 should possibly have aroused suspicion of a retrobulbar or toxic neuritis and have dissuaded us from operating. However, charts made earlier in the progress of the malady and those which were plotted soon after the patient's hos-

pital admission, when there was fair vision in the right eye, showed defects so definitely bitemporal that exploration seemed justifiable.

What may have been the relation of a possible syphilitic infection in this case and in that of other cases of similar type in the series of chiasmal cases remains obscure. The possibility is not likely to be overlooked in these days of chemical tests for syphilis, and probably more patients with optic atrophy are treated for presumptive syphilis, when there is no occasion for it other than as a diagnostic test, than there are actually syphilitic patients in whom the appropriate treatment is neglected.

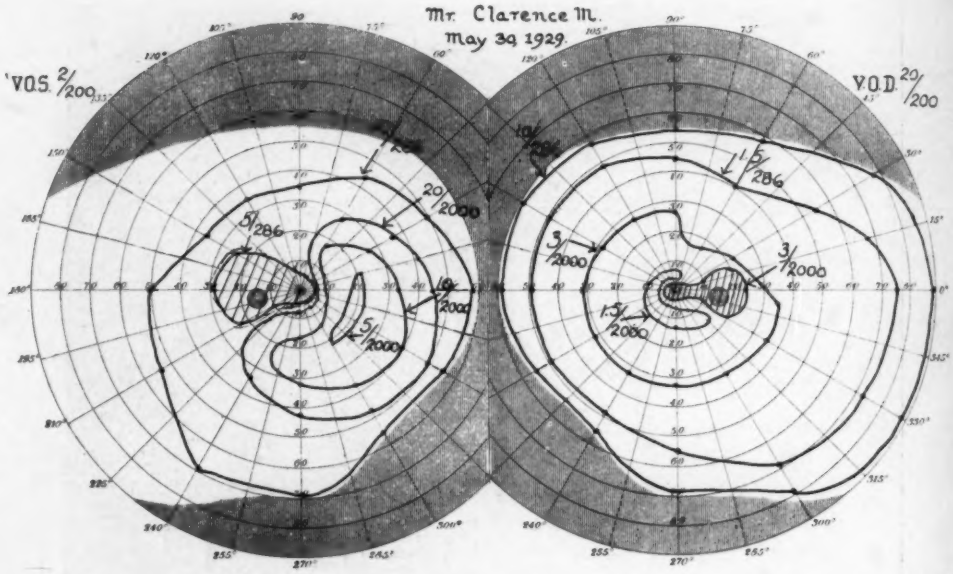

Fig. 76 (case 14).—Fields plotted by Dr. Clifford B. Walker the day before operation on a patient with a pseudotumor syndrome.

It will be gathered from the description of the operation that a demonstrable thickening of the arachnoid constituting the cisterna chiasmatis was disclosed with a great abundance of fluid, evacuation of which left the nerves high and dry bridging across the empty space. For a similar condition, when found elsewhere, the term "chronic cisternal arachnoiditis" has been used.

This term, "chronic arachnoiditis," has been employed in the clinic for the past several years,[16] more particularly for those examples of

16. Horrax, Gilbert: Generalized Cisternal Arachnoiditis Simulating Cerebellar Tumor: Its Surgical Treatment and End-Results, Arch. Surg. **4**:95-112 (July) 1924.

pseudotumor with a definite cerebellar tumor syndome in which at operation nothing has been found but an excess of fluid associated with a grayish and thick-walled arachnoid lining the posterior and lateral cisternae. In all of these cases, a choked disk was present; in many of them the symptoms promptly subsided after the operation, and in most instances there has been no subsequent return of symptoms. The diagnosis of cisternal arachnoiditis, however, is one that I am exceedingly loathe to make in the absence of postmortem examination, for one may be easily deluded, and not a few patients with symptoms ascribed to such a process have subsequently proved to have tumor.

In applying this diagnosis to the case just recorded, the absence not only of a choked disk but of all subjective evidence of cerebrospinal fluid obstruction will be promptly noted. Hence, there are obvious incon-

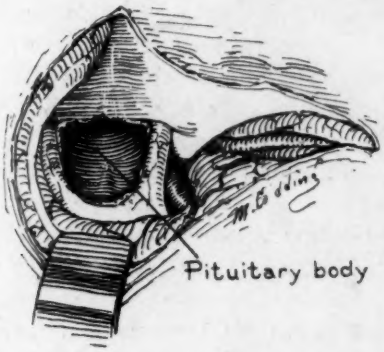

Fig. 77 (case 14).—Slightly postfixed chiasm in a case of presumed arachnoiditis associated with a chiasmal syndrome.

sistencies in the symptomatology of these cases of supposed cisternal arachnoiditis. It is difficult to explain why there should have been no improvement in sight after the operation in such a case, if the trapped fluid was the sole cause of the loss of vision, when vision will promptly return to blind fields in eyes showing optic atrophy after the successful removal of solid tumors. The answer may lie in the fact that the same process which causes the thickening of the pia-arachnoid may likewise affect and permanently damage the optic nerves. There is, however, no pathologic basis for this assumption.

The foregoing case by no means represents all of our negative explorations for presumed suprasellar tumor, though it is a fair sample of the several transfrontal explorations in which the observations have been negative for tumor and only a thickened arachnoid with excess of fluid has been found. It must be acknowledged at the same time that some of the small suprasellar tumors are associated with a superabun-

dance of fluid and an apparent thickening of the leptomeninges, so that at best a line of division between an abnormal and a normal arachnoidea cannot be drawn with any precision.

That a mild meningeal reaction may be produced in the cerebellopontile cisternae by an inflammatory process in the middle ear with symptoms suggesting those of an acoustic tumor, is well known. There is no reason, therefore, why a similar process might not occur in the chiasmal cistern in association with inflammatory processes in the accessory paranasal sinuses. It may be said, however, that in our series of patients with a chiasmal syndrome that have been previously subjected to intranasal operations, rarely has any definite suppurative process been found in the paranasal sinuses. No pathologist, so far as I know, has been able to demonstrate any histologic evidence of disease in the supposedly "hypertrophic mucus membranes" and "spongy bones" that are so commonly removed from the ethmoidal region of patients with optic atrophy, and it is not to be forgotten that the operations are apt to leave a chronic suppurative process behind them. Frankly suppurating sphenoidal or ethmoidal cells may sometimes produce paracentral scotomas with disturbances of vision;[17] but we should be cautious in ascribing unexplainable optic atrophy to undemonstrable infections in the schneiderian recesses, particularly in patients who show at the same time a tendency to bitemporal loss of vision.

The foregoing paragraph, I am aware, raises a moot subject on which rhinologic and neurologic surgeons are likely to hold prejudicial opinions. Somewhat to his embarrassment, it is the ophthalmologist who must make the final decision between a possible intranasal or a possible intracranial primary cause of an existent optic atrophy. And when so distinguished an ophthalmologist as van der Hoeve [18] describes beneficial results from rhinologic procedures for these conditions, there can be no doubt of their therapeutic value in properly selected cases. What we must all strive for is the avoidance of futile operations either on the part of the neurosurgeon, as in case 14, or on the part of the rhinologist, as recorded, for example, in the history of case 6. Unquestionably misdirected procedures would less often be carried out if the ophthalmologist took it on himself not only to make the decision but to put it to the test by conducting his own intracranial and intranasal explorations rather than turn them over to others. That day may possibly come.

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17. An excellent example of this has been recorded by Walker, C. B.: The Value of Quantitative Perimetry in the Study of Post-Ethmoidal Sphenoidal Sinusitis Causing Visual Defects, Boston M. & S. J. **185**:321-326, 1921.

18. Van der Hoeve, J.: Optic Nerve and Accessory Sinuses, Ann. Otol., Rhin. & Laryng. **31**:297-310, 1922.

GENERAL DIAGNOSTIC CONSIDERATIONS

In the past decade, a rapidly increasing number of osteoplastic transfrontal explorations, of the type employed for exposure of the chiasmal region, have been performed.[19] The preoperative diagnosis either of a pituitary adenoma or craniopharyngioma was unmistakable in the majority of the cases on the grounds either of a widely expanded sella or of suprasellar calcification in association with the usual secondary evidences of disordered pituitary function. The figures for the three major diagnostic groups with which I am at present chiefly concerned are as follows:

(1) Craniopharyngeal duct tumor (craniopharyngioma). This diagnosis was made 67 times and proved correct in 45 cases, 38 of them having been histologically verified. In the 22 cases incorrectly diagnosed, the lesion proved to be glioma of the chiasm in 8, a pituitary adenoma in 10, a suprasellar meningioma in 2, and "arachnoiditis" in 2 instances.

(2) Pituitary adenoma. This diagnosis was made in 42 cases, correctly in 33, incorrectly in 9 instances. The cases wrongly diagnosed proved to be craniopharyngioma 3, suprasellar meningioma 2, tumor of third ventricle 2, unverified lesions 2. This statement on the whole is less favorable than it appears, since 20 pituitary adenomas were exposed that had been variously and incorrectly diagnosed either because of a small and unexpanded sella, because of the presence of calcification or for some other reason.

(3) Meningioma. This diagnosis was made 40 times, correctly in twenty-three instances. (The list includes 13 meningiomas arising from the olfactory groove or sphenoidal ridge, all but one correctly diagnosed by their own characteristic syndrome.) The 17 cases incorrectly diagnosed were pituitary adenoma in 7, a craniopharyngioma in 6, an aneurysm in 2 and arachnoiditis in 2 instances. For obvious reasons, as will be evident from these figures, there has been a tendency to favor the preoperative diagnosis of meningioma.

(4) Other lesions met with in the course of the 186 transfrontal explorations are numerically less well represented. Some of the operations were for easily diagnosed conditions, such as orbito-ethmoidal osteomas, having little or no relation to the present topic. In none of the other cases, most of them representing suprasellar lesions like the 2 aneurysms, the examples of so-called arachnoiditis, one chordoma, one cholesteatoma, etc., was a correct diagnosis made.

Unquestionably now that attention is being drawn by ophthalmologists, neurologists and neurosurgeons to the syndrome of suprasellar lesions, more careful scrutiny of the following three main points of symptomatology on which the diagnosis rests will be forthcoming.

19. A special study of 186 of these cases, from a surgical and diagnostic standpoint, has been made by Dr. E. M. Deery (to appear in J. Nerv. & Ment. Dis., 1930), an assistant in the clinic, to whom I am indebted for the figures here quoted. There has been a case mortality of approximately 10 per cent, irrespective of the type of lesion encountered. The fatalities have been due to an unrecognized postoperative clot, to overdoing the attempted extirpation of large tumors or to the inevitable progress of symptoms in cases of inoperable, malignant tumors. Operations for the type of lesions I am here discussing have a negligible mortality.

1. *The character of the primary optic atrophy.* This probably differs in no essential respect from the observable changes in the optic papilla due to pressure against chiasm and nerves by regional tumors of any sort. Nevertheless the eyegrounds may well enough be scrutinized even more closely than before in view of the fact, mentioned in some of the case reports (e. g., cases 1, 3 and 6), that it may sometimes be difficult to tell whether atrophy is actually present or not. Ophthalmologists who have been interviewed on the subject have been surprised to learn that a patient might have a hemianopsia and visual acuity reduced to 20/200 or below with so slight a degree of pallor apparent in the nerve head that there might be a difference of opinion as to the actual presence of atrophy.

2. *The bitemporal character and progress of the field defects.* The proper interpretation of the visual field defects is unquestionably of greater diagnostic value in suprasellar lesions than the changes in the eyegrounds, important as these may be. It would be unfortunate, however, if symmetry of the field defects or their tendency to progress from above downward in a suprasellar tumor should have been so emphasized that exceptions to the rule will be overlooked.

As a matter of fact, rarely if ever do the defects progress equally step by step in the two eyes. One eye may have become wholly blind from a suprasellar tumor before the other is much affected, showing that one of the nerves may be completely thrown out of function before the chiasm begins to show evidence of pressure or stretching. Again, when the chiasm appears to be primarily affected and fairly symmetrical bitemporal defects actually are produced, these defects do not invariably progress from above downward, but, as emphasized in the comment on case 13 (cf. fig. 70, they may be almost entirely restricted to the lower quadrants (cf. figs. 33, 47 and 48).

The use of the ophthalmoscope is wholly objective, whereas perimetry is a subjectively interpretative art much more difficult to acquire. Not only is the plotting of dependable fields a time consuming performance, but it is one which requires skill, accuracy, unbounded patience and no little mathematical sense.

If one may judge from the character of the perimetric charts which are forwarded with many patients, ophthalmologists as a rule are far less painstaking in plotting the fields of vision than neurosurgeons feel obliged to be. This may possibly be due to the fact that the success or failure of one of these chiasmal operations is measured in terms of perimetry just as the ophthalmoscope, by the measured subsidence in the height of the swelling, records the success or failure of an operation for tumor that has caused a choked disk.

The neurosurgeon, therefore, in all probability, scrutinizes the eye-grounds with an ophthalmoscope and takes fields of vision, when deviations from the normal are present, with greater care and far more often than the ophthalmologist or neurologist would ever think of doing. It is a form of drudgery from which busy practitioners gladly escape.

For what is known at the Brigham Hospital of the principles of perimetry as formulated by Bjerrum and Rönne, we are wholly indebted to the traditions established in the clinic in 1913 by Dr. C. B. Walker whose several admirable papers on the subject have subsequently appeared.[20] Dr. Walker so systematized the somewhat cumbersome methods of his predecessors by time-saving devices that the plotting of fields, particularly in the difficult class of neurologic patients who were often bedridden, became greatly facilitated without loss of accuracy. This was accompanied by the elimination, so far as possible, of distractions in the procedure; by the cultivation of the memory system; by the elaboration of novel forms of apparatus, making the tests possible for any degree of recumbency of the patient; by the substitution of minute graded white test objects in place of colors. Also by a great increase in size of the usual charts, with opening out of the central areas on a Mercator projection scheme, thus providing a larger scale for the smaller visual angles, Dr. Walker has made it possible to record the serial isopters obtained by graded test objects for the circumscribed paramacular region as well as those for the peripheries on a single chart.[21]

It cannot be expected that all who are called on to plot the fields of patients in the clinic can share Dr. Walker's skill, and it will be seen that in making the charts that are herein reproduced reliance has been routinely placed on 2, 3 and 5 mm. test objects on the screen at 2,000 mm. distance.

In venturing as a surgeon to speak of perimetry, I am conscious of trespassing on a territory not my own, but it is safe to say that the temporal field defects of the suprasellar tumors under discussion will come to be detected far earlier and their advance observed with greater

20. Walker, Clifford B.: Some New Instruments for Measuring Visual-Field Defects, Arch. Ophth. **42**:577-591, 1913; A Contribution to the Study of Bitemporal Hemianopsia with New Instruments and Methods for Detecting Slight Changes, ibid. **44**:369-402, 1915; Studies of Optic-Nerve Atrophy in Association with Chiasmal Lesions, ibid. **45**:407-437, 1916; Neurological Perimetry and a Method of Imitating Daylight with Electric Illumination, Tr. Sect. Ophth., A. M. A., 1917, pp. 189-202; Quantitative Perimetry: Practical Devices and Errors, Arch. Ophth. **46**:537-561, 1917; The Time Element in Quantitative Perimetry, Arch. Surg. **18**:102-144, 1929.

21. For convenience of reproduction the visual fields that accompany this paper have been transferred from the charts on which they were originally plotted to the type of small charts in general use.

precision if the methods of quantitative perimetry, as recently set forth in Traquair's monograph,[22] come to be routinely employed.

The chief difficulties in the accurate quantitative plotting of fields of vision lie in the necessity of properly interpreting the patient's interpretation of his visual impressions. All neurologists are familiar with precisely the same difficulties in the plotting of anesthetic skin fields when, for example, one endeavors to record the precise boundaries of anesthetic or hypesthetic areas produced by a spinal cord lesion. In high cervical lesions there is one zone at which the neurologist concentrates particular attention: namely, at the cutaneous level of the second intercostal segment. Just so the ophthalmologist in examining a patient with subjective failure of vision and a suspicious appearance of pallor in the nerve may do well to concentrate his attention on the upper temporal peripheries with the use of minute graded disks.

3. *The question of normality of the sella turcica.* Lastly, further progress in the differential diagnosis of tumors causing the chiasmal syndrome will demand a closer inspection than heretofore of the sella turcica and its variations on the part of the roentgenologist. What is needed is a more precise determination of the commonly neglected minor evidences of pressure erosion in the boundaries of a pituitary fossa that would generally pass as normal. The sharpening of the anterior clinoid processes, the angulations and degree of thinning of the dorsum sellae, the evidence of roughening or partial absorption of the sulcus chiasmatis, the enlargement of the optic foramina, the general form and position of the nonexpanded sella — all these things need further detailed study.

On the grounds of differential diagnosis, it will have been gathered from the description of the cases selected to illustrate this report that:

1. The syndrome in its purest form accompanies the *suprasellar meningiomas.*

2. Essentially the same group of symptoms may be produced by a *pituitary adenoma* which has failed to enlarge the sella, though in all instances, in retrospect, the symptoms have tended to be more rapid in onset and show a degree of sellar atrophy that is absent in the meningioma cases.

3. *Suprasellar craniopharyngiomas* are likely to be differentiable not only from their predisposition to undergo calcification, visible on the x-ray films, but from their greater tendency to show hypothalamic symptoms.

4. *Gliomas of the chiasm* rarely occur in adults, do not as a rule have such clearcut hemianopsias and are apt to be accompanied by

22. Traquair: Introduction to Clinical Perimetry, London, Henry Kimpton, 1927.

distension of the optic foramina, which can usually be detected by the x-rays.

5. Concomitant vascular hypertension should arouse the suspicion of a *suprasellar aneurysm.*

6. Large central scotomas indicating more precocious involvement of the central (macular) bundles than of the crossed peripheral bundles speak in favor of a "retrobulbar neuritis" or at least of *some process other than tumor.*

CONCLUSIONS

The neurosurgeon has more or less unconsciously played a not unimportant rôle in ophthalmology. It was through his early efforts to attack tumors of the brain that what is known as a choked disk was shown to be a mechanical rather than an inflammatory or toxic process in the vast majority of cases. Similarly, it has been to his credit to have shown that not a few of the primary optic atrophies are attributable to a retrobulbar tumor rather than to a retrobulbar toxic or inflammatory process.

This has come about largely through the elaboration of an intracranial procedure to expose the suprasellar region for the purpose of attacking pituitary tumors that had come to involve the chiasm by pressure. Most of these cases in the beginning were unmistakable pituitary adenomas with an enlarged sella, so that there was no preoperative doubt as to the diagnosis.

Other tumors which are often suprasellar rather than intrasellar in origin are equally capable of pressing on the chiasm and of producing bitemporal hemianopsia and primary optic atrophy, the commonest of them being those tumors that arise from "anlagen" of Rathke's duct. In the course of exploratory operations supposedly for tumors of this sort, lesions of other kinds have occasionally been encountered, usually in patients whose visual disturbances had previously been ascribed to retrobulbar neuritis.

Certain of these suprasellar tumors, more particularly the meningiomas that arise from the membrane over the sulcus chiasmatis, prove to be most favorable for operative removal. The characteristic syndrome of these tumors of *primary atrophy with bitemporal field defects in adult patients with an essentially normal sella* may be simulated not only by other tumors (adenomas, chiasmal gliomas, craniopharyngiomas, etc.), but by a variety of conditions which with further study should be capable of clinical differentiation without the necessity of an exploratory operation.

ECTOPIC CONE NUCLEI *

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In pathologic specimens one occasionally sees a cone nucleus lying outside the external limiting membrane. In routine preparations, gross distortion of these delicate structures due to pathologic and postmortem changes and to crude technic undoubtedly accounts for many such appearances, but the anomaly exists in occasional normal retinae; we feel that a description based on a clinically and histologically normal eye, fixed especially for a study of the visual cells, may prove of interest.

Although Parsons [1] attributed the discovery of ectopic cone nuclei to van Genderen Stort, the condition was first seen by Stöhr,[2] who found many such nuclei in a clinically normal eye. He was not sure as to whether these nuclei were the only ones in their respective cells or were extra, but thought the former more likely. Stöhr's figures show the anomalous cells to be otherwise normal; there is no diminution in length or diameter and no compression of the ellipsoid by the ectopic nucleus, which he figured as spherical. He thought that the situation might be related to the migration of cones in light and darkness, the discovery of which had just been announced by Stort.

Solger [3] demonstrated a case in which sections of the macular region showed cone nuclei lying partially or wholly through the limitans. He considered that a relation to cone migration was ruled out by their sparsity and by the lack of a relation between the length of the inner segment and the position of the nucleus. Solger concluded that the situation was an embryonic anomaly produced by variation in the length of the developing inner segment.

Borysikiewicz [4] considered the phenomenon of universal occurrence and claimed to have found "exponierten Körner" in rods as well as in

* Submitted for publication, March 17, 1930.
* From the University of Michigan, Ann Arbor.

1. Parsons, J. H.: The Pathology of the Eye, London, Hodder & Stoughton, 1904, vol. 2, p. 543.

2. Stöhr, P.: Beiträge zur mikroskopischen Anatomie des menschlichen Körpers, Verhandl. d. phys.-med. Gesellsch., Würzburg, 1887, vol. 20.

3. Solger: Report of Demonstration, Deutsche med. Wchnschr. **16**:199, 1890.

4. Borysikiewicz, M.: Untersuchungen über den feineren Bau der Netzhaut, Leipzig, Deuticke, 1887; Weitere Untersuchungen über den feineren Bau der Netzhaut, Deuticke, 1894.

cones and in any part of the cell, even the outer segment. He made the further statement that in the region of the macula every cone has such a nucleus, while none occur in the fovea centralis. His description evoked comments of surprise and incredulity from Dimmer [5] and subsequent investigators. An examination of his drawings and their labels reveals a fact which his critics have not remarked—Borysikiewicz considered the ellipsoid to be a nucleus. This organelle is, of course, conspicuous in the general fundus cones, but not in those of the fovea; he probably did not see true ectopic cone nuclei.

Dimmer [5] described three cases; in two of them preservation was so poor that it could only be seen that such nuclei were present in the macular region. The third case was more favorable and was described in detail. Dimmer found the anomalous cones to be morphologically quite unlike the typical cones of the fundus. They were more slender, being only 4.6 microns in major diameter, and were only from 21 to 25 microns long. They were cylindric for two-thirds of their length, then came to an abrupt point. This distal pointed portion was frequently missing, apparently being blown off by the formation of a vacuole under it, which was often seen in intact examples. There was no demarcation into inner and outer segments. The anomalous cones were abnormally eosinophilic, rendering them conspicuous; they were numerous in the fundus and occurred in the macula but not in the fovea.

Dimmer stressed the fact that the anomalous cones he found were morphologically peculiar in respects other than the location of the nucleus; he also emphasized his observation that the nucleus lay either wholly outside the membrane or in its normal position—he saw no instances of partial protrusion as did Solger. In view of Dimmer's description of the frequent explosion of the cells by artificial vacuoles, one might be tempted to dismiss all his structural differences from the normal cones as artefacts; but his figures of normal cones from the vicinity are acceptable, and such features as heavy staining and homogeneity are difficult to pass off in this way. We are convinced that Dimmer's case was as described, and, as will appear later, it is probably unique.

Greeff [6] named these ectopic nuclei "vorgelagerter Körner," and stated that they were usually demonstrable in the macular region. While

5. Dimmer, F.: Beiträge zur Anatomie und Physiologie der Macula lutea des Menschen, Leipzig, Deuticke, 1894.

6. Greeff, R.: Die mikroskopische Anatomie des Sehnerven und der Netzhaut, in Graefe-Saemisch: Handbuch der gesamten Augenheilkunde, ed. 2, Leipzig, Engelmann, 1900, nos. 17, 20, 21 and 22.

the occurrence of something of the sort is not rare in routine preparations, we do not find them in the majority of our human specimens.

Verhoeff [7] likewise considered "extruded nuclei"[8] to be of common occurrence, and described a case. He found the ectopic nuclei to be of two kinds. The first type was characterized by the presence distal to it of "a clear crescent-shaped space, suggesting that the nucleus is situated in a vacuole which it does not quite fill." These nuclei were not limited to any special locations. The second type lacked the attendant vacuole and occurred only opposite blood vessels which were of such size that they deformed the limitans along their course. The cones (and rods) in these locations were shorter and thicker than the normal cells. Verhoeff formerly considered this second type of ectopic nucleus to be caused by the pressure of the adjacent vessel; he does not now think this true,[9] as he has found that they frequently occur without relation to vessels.

We have found no descriptions of specific cases since Verhoeff's contribution. Parsons [1] and Salzmann [10] mention this anomaly, and seem to regard it of common or universal occurrence.

Ectopic cone nuclei have been reported for an ape, *Cercopithecus* (Garten [11]), for the domestic cow (Zürn [12]) and for the lamprey (Walls [13]). Garten found them in both light-adapted and dark-adapted eyes from the same ape; this definitely eliminates any relation to cone migration in that species.

One of us (G. L. W.) found ectopic rod nuclei in the, presumably, cone-free retina of the bat, *Myotis lucifugus*. Only the one specimen of the latter has as yet been examined.

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7. Verhoeff, F. H.: Some Remarks on the Use of Mallory's Phosphotungstic Acid Hematoxylin, Roy. London Hosp. Rep. **15**:299, 1903.

8. We have chosen not to employ this term, as it implies that the nuclei are pushed through the limitans after the latter has formed. As will appear later, we believe another explanation of this phenomenon to be more probable.

9. Personal communication to the authors.

10. Salzmann, M.: Anatomie und Histologie des menschlichen Augapfels im Normalzustande, Leipzig, Deuticke, 1912.

11. Garten, S.: Die Veränderungen der Netzhaut durch Licht, in Graefe-Saemisch: Handbuch der Gesamten Augenheilkunde, ed. 2, Leipzig, Engelmann, 1907, nos. 119-121.

12. Zürn, J.: Vergleichend-histologische Untersuchungen über die Retina und Area centralis retinae der Haussäugetiere, Arch. f. Anat. u. Physiol., Suppl., 1902, pp. 99-146.

13. Walls, G. L.: An Experimental Study of the Retina of the Brook Lamprey, Entosphenus Appendix (DeKay), J. Comp Neurol. **46**:465, 1928. The junior author is now in a position to say that this situation is normal for most species of lampreys.

AUTHORS' CASE

We have found ectopic cone nuclei in the clinically normal eye [14] of a man, aged 61 (figs. 1 and 2). They are most numerous in the central fundus; in horizontal sections through the disk and fovea they average in number about 9 per millimeter from the disk to a point 3 mm. temporally from the fovea. None were seen nearer than 320 microns to the center of the fovea. There are a few concentrated just nasal to the disk and a few others scattered further nasally for 3 mm. They occurred, widely scattered, practically to the ora serrata dorsally. They occur temporally, at least as far as 4 mm. from the fovea, and are not

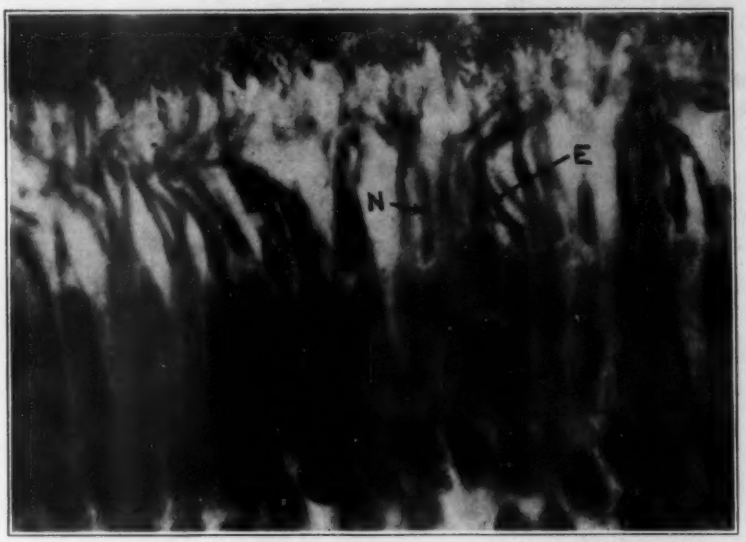

Fig. 1.—The visual cells 1 mm. temporally from the center of the fovea. The cone marked "*E*" has an ectopic nucleus showing the intranuclear vacuole.

present within 10 mm. of the ora serrata in that quadrant. Unfortunately, owing to the loss of material in trimming the blocks for cutting, we are unable to say where between these points the last of them lie. They do not occur within 13 mm. of the ora serrata ventrally, but here also material was lost from the fundus by trimming.

The ectopic nuclei are thus seen to be chiefly restricted to a fairly large central patch of the retina, only a few being found very far peripherally, and these only in the dorsal quadrant. All but a very few

14. A description of the normal visual cells of this retina will appear elsewhere. A more detailed account of the clinical and technologic history of this material will be given in that place.

were found to be wholly beyond the limitans. All but one of those that protruded partially were in massive peripheral cones the myoids of which were greater in diameter than the nuclei; these nuclei cannot strictly be said to protrude through the membrane. The one exception was considerably elongated and clearly constricted into a dumb-bell shape by the limitans.

The anomalous cones were certainly not smaller than the normal ones. On the contrary, their inner segments were often slightly longer. They were not always isolated, as Parsons [1] maintained; groups of two and three were found adjacent. They showed no qualitative structural peculiarities, but in most of them the ellipsoid was shortened (fig. 2, *A*).

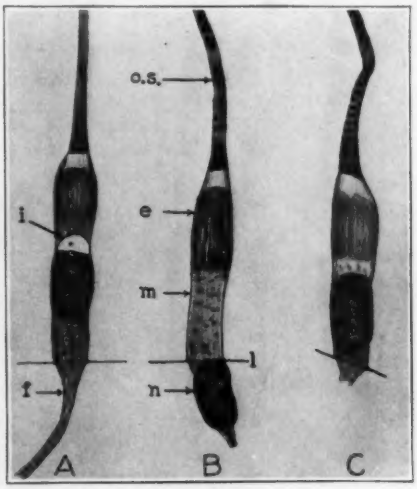

Fig. 2.—*A*, the cone marked "*E*" in figure 1. The tip of the outer segment is not shown, as it disappeared in the processes of the pigment epithelium. *f* indicates cone-fiber; *i*, intranuclear vacuole. *B*, a normal cone adjacent to *A*. It is marked "*N*" in figure 1, but is out of focus in the photograph. o.s. indicates the outer segment; e, ellipsoid; m, myoid; n, nucleus; l, limitans. *C*, cone from a point 1.64 mm. nasally from the center of the fovea. The tip of the outer segment is broken off. There is no intranuclear vacuole. *A*, *B* and *C*; × 1,000.

A few were found near retinal vessels ventral to the disk, and one or two in the temporal periphery; we regard these associations as coincidental.

Among the ectopic nuclei themselves a most striking differentiation was noted. All but one or two of those within 1.25 mm. of the center of the fovea possessed a clear vacuole in their distal ends (fig. 1; fig. 2, *A*). This vacuole is intranuclear; chromatin granules occur along its

distal border, and an occasional granule is suspended within the vacuole. None of the ectopic nuclei further than 1.25 mm. from the fovea had such a vacuole. This is not the same thing as the perinuclear shrinkage space of Verhoeff; one or two cells answering his description were also found.

The significance of these vacuoles is problematic. They would seem to indicate a difference in the density of the interbacillar fluid in and outside of the macular region.

COMMENT

The explanations offered for this anomaly by Stöhr and Solger are, respectively, improbable and vague. The essential points to be interpreted by a logical hypothesis are:

1. It is usual for cone nuclei to lie inside the external limiting membrane, but in occasional cases some of them occur on the choroidal side.

2. Ectopic cone nuclei are not rare, but rod nuclei have never been described lying outside the limitans in man or in any animal whose cone nuclei abut on the limitans. (In amphibia, in which the rod nuclei lie against the membrane, they sometimes bulge partly through it in dark-adaptation.)

3. Ectopic cone nuclei are most numerous in the central fundus, but are absent from the fovea centralis.

4. Cone nuclei lie either above or below the membrane, rarely being partially protruded. When they do occur in such a situation, they are constricted by the membrane.

As is common knowledge, the outer boundary of the embryonic retina is not at first the true limitans, but has been given the name of "margo limitans externa" or "pseudo-external limiting membrane." According to Seefelder [15] and Mann,[16] the cones at the posterior pole in the 48 mm. embryo are already starting to differentiate, and the anlage of the outer segment can be seen. It is not until the cones are considerably elongated and have protruded for some distance beyond the "margo" that the outer ends of the Müller's fibers expand and interlace to form the true membrane. The lacunae of this membrane then gradually diminish in size as the membrane toughens and tightens around the visual cells. The young rod is too slender and its nucleus too far

15. Seefelder, R.: Beiträge zur Entwickelung des menschlichen Auges mit besonderer Berücksichtigung des Verschlusses der fötalen Augenspalte, Anat. Hefte **48**:453, 1913.

16. Mann, I.: The Development of the Human Eye, Cambridge, England, University Press, 1928.

from the membrane for it to be possible for a rod nucleus to pass the level of the developing membrane. The cone inner segment, on the other hand, is larger than it is in the adult, and easily large enough to admit the cone nucleus.

If now the formation of the limitans should be abnormally late in any individual, many cone nuclei might by the time it forms have been carried by the elongation of their cells to various distances through and beyond the "margo." The subsequent constriction of the membrane around each cone would squeeze such a nucleus and force it either wholly above or wholly below the membrane. Except in rare cases the partially protruding nuclei could no more maintain such a position than can a melon seed keep its place between finger-tips when it is pressed. The toughness of the limitans is attested by its sharp delineation of the outer border of the external nuclear layer and the severe alinement of the abutting nuclei and by the marked constriction of the solitary partially protruded nucleus which we have seen.

The distribution of ectopic cone nuclei is adequately explained by this theory. The cones at the posterior pole are the earliest to differentiate. If the development of the external limiting membrane is delayed, a preponderance of ectopic cone nuclei in the central fundus would be expected; all writers agree that this is the case. Differentiation of the visual cells in the region of the fovea, however, lags behind the surrounding retina and is not complete until the fourth month post partum; this, coupled with the slenderness of the foveal cones, explains the absence of ectopic nuclei in this location. The membrane, however late to form, is sufficiently strong by the time of birth to keep below it any foveal cone nuclei that may later press against it.

A case like that described by Solger, in which numerous partially protruding nuclei occur, would seem to require an extreme delicacy of the membrane as well as a delay in its formation. This is probably the situation in lampreys, in which many nuclei only partially protrude and in which the limitans is so diaphanous that its very existence in these forms has been denied by one investigator (Kohl [17]).

Dimmer's suggestion of a possible special function of these cells does not seem reasonable to us, for they are otherwise normal; moreover, ectopic rod nuclei may occur when rod nuclei occupy the marginal position, as in the pure rod retina of the bat. The very peculiar cells described by Dimmer may well have been functionally abnormal; it is unfortunate that no similar cases have been found.

17. Kohl, C.: Das Auge von Petromyzon planeri und von Myxine glutinosa, Leipzig-Reudnitz, Schmidt, 1892.

CONCLUSIONS

We believe that the occurrence in normal human retinae of cone nuclei outside the external limiting membrane is a developmental anomaly produced by a minor disturbance of the time relation between the differentiation of the cones and the formation of the external limiting membrane.

All the characteristics of this anomaly are adequately explained by this theory, including the distribution in man and our observations on lower animals; viz., the occasional ectopic rod nuclei in the cone-free retina of the bat and the common occurrence of ectopic cone nuclei in the lamprey, where the limitans is very thin.

ACUTE OCULAR PEMPHIGUS

REPORT OF A CASE *

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Pemphigus is described as an acute or chronic disease of the skin and mucous membranes, characterized by the formation of rounded or oval blebs arising from apparently normal surfaces, which may or may not be accompanied by constitutional symptoms. Some cases may be so severe that death ensues.

Dermatologists divide pemphigus into the acute and the chronic forms, as well as pemphigus foliaceus and vegetans, and they apply the terms benign, malignant, gangrenous and hemorrhagic to describe the clinical aspects of the disease.

Acute pemphigus is characterized by the sudden eruption of bullae, appearing in crops, the contents of which are clear at first but soon become opaque or hemorrhagic and occasionally gangrenous. Febrile disturbances with a severe catarrhal conjunctivitis may be present. In mild cases the blebs become absorbed under dry crusts, and recovery takes place without scarring. The site of predilection in the conjunctiva is the lower half of the ocular conjunctiva and the inner angle of the lids. As the shinkage continues, symblepharon develops.

Chronic pemphigus runs a long course, with cycles of attacks and sometimes remissions.

Pemphigus is a rare disease, attacking persons of all ages and both sexes and is not hereditary. The etiology is obscure and the prognosis uncertain.

The diseases that may be confused with pemphigus are erythema bullosum, dermatitis herpetiformis and syphilis.

Prior to the middle of the nineteenth century, pemphigus of the eye was classified with urticaria and scabies of the face and eyes, although its true nature was recognized by Wichman as early as 1800. White Cooper, in the first volume of the *Royal London Ophthalmic Hospital Report* for 1858, considered it to be a distinct infection. Stellwag, in 1870, described it as "sydesmitis degenerativa." Kries characterized it as an "essential shrinking of the conjunctiva," as did von Graefe in 1879, and believed it to be analogous to pemphigus of the skin. Accordingly, this dictum is accepted by most observers today. Francke, however, suggested that "conjunctival shrinkage with bleb formation" be substituted for pemphigus.

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Groenouw said that essential shrinkage of the conjunctiva without the formation of blebs and membranes is not always pemphigus, and that the disease always occurs in both eyes, although not necessarily simultaneously.

Schonfelder [1] reported two cases of ocular pemphigus, one of which followed the introduction of a kernel of barley. Both cases showed conjunctival shrinkage.

A case of essential shrinkage of the conjunctiva of seven years' duration was reported by Juler. Blindness had occurred within the first two years of the disease.

Bane and Bane [2] observed a patient with ocular pemphigus over a period of fourteen years. The left eye was first affected. Transplants of conjunctiva and roentgen treatments gave good results but were ineffectual in the treatment of the right eye, which became involved about seven years after the left. The disease progressed, invading the cornea and producing a symblepharon.

One of the best articles on ocular pemphigus is found in Arnold Knapp's "Medical Ophthalmology." [3] Statistics and cases of great interest are cited.

Various remedies have been tried, with good and bad results. By the use of methylthionine chloride, U. S. P., ethylmorphine hydrochloride and pilocarpine, Roure [4] was able to arrest a case; at the end of three years the disease was quiescent. De St. Martin [5] reported a case of heredosyphilitic pemphigus of the conjunctiva in a woman, aged 24, in whom the lesion first appeared at 15 months of age. No other part of the body showed a lesion. The Wassermann reaction was strongly positive, and the condition yielded to antisyphilitic treatment.

There is no constant relation between the duration of the disease of the skin and the development of ocular lesions. Coincident pemphigus of the integument must be present before a positive diagnosis of ocular pemphigus can be made. The condition may begin as a general pemphigus, with involvement of the conjunctiva some years later. Cases have been known to occur in which the conjunctiva was attacked primarily and the skin lesions developed later; this, however, is the exception rather than the rule.

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1. Schonfelder, R.: Histology of Pemphigus of Conjunctiva, Klin. Monatsbl. f. Augenh. **73**:217, 1924.

2. Bane and Bane: Ocular Pemphigus, Am. J. Ophth. **5**:221, 1922.

3. Knapp, Arnold: Medical Ophthalmology, Philadelphia, P. Blakiston's Son & Company, 1918, p. 453.

4. Roure: Treatment of Ocular Pemphigus, Ann. d'ocul. **159**:541, 1922.

5. De St. Martin: Heredosyphilitic Pemphigus of the Conjunctiva, Ann. d'ocul. **158**:338, 1921.

The subjective symptoms are not characteristic but consist usually of soreness, tenderness, burning and itching with diffuse discharge. The involved areas are rapidly converted into cicatrices with excessive contraction. The conjunctiva shrinks, becomes white and tense and the folds disappear. Bands form which extend from the globe to the lids producing varying degrees of symblepharon. The lacrimal ducts may be occluded and the conjunctiva becomes dry, often with resulting total symblepharon. The cornea is involved by extension of the conjunctival process. Ulceration and suppurative keratitis may be found early in the disease.

The pathology is obscure. According to Sattler, the swelling of the conjunctiva is caused by swelling of the connective tissue bundles and expansion of the interstices, filled with fluid, and not by infiltration of the conjunctiva with lymphoid cells.

Bacteriologic examination is unsatisfactory, and nothing can be deduced from the results thus far attained. Some observers have found the blisters sterile; others have found streptococci and staphylococci.

Treatment is symptomatic. Arsenic, arsphenamine and neoarsphenamine have been used, as have radium, x-rays and high frequency current, and have proved ineffectual. Any form of treatment has not been uniformly successful.

REPORT OF CASE

A negro, aged 48, complained of tearing and itching of the eyes for four weeks. Until this time he had had no trouble with his eyes. There was no history of familial ocular diseases.

Four weeks before examination he was shaved in a barber shop. Two days later an eruption appeared on the neck and chest, and the eyes began to itch and burn. He thought that he scratched the eruption on his neck and chest and then rubbed his eyes frequently. Vision was 20/50 on the right, and 20/200 on the left. No improvement occurred with glasses.

The left eye showed considerable mucopurulent secretion. The lids stuck together. There were many bandlike adhesions between the bulbar and the palpebral conjunctiva; also areas of an ulcerated appearance, which bled readily when wiped with a cotton applicator. Motility was limited in all directions. There was beginning extension of this vascularized tissue to the nasal side of the cornea. The eye had a wet soggy appearance.

The right eye presented a similar but less marked picture.

The iris of the left eye had a grayish segment extending from the pupillary border at from 9 to 10 o'clock into the ciliary zone, 2 mm. wide and 4 mm. long. The right iris showed a similar zone in the position of from 2 to 3 o'clock, and a little larger one on the temporal side, at from 9 to 10 o'clock. The patient had not noticed these and could not be sure how long they had been present. Within three weeks the pupils became elongated as if drawn toward these segments. Transillumination was not definite. Whether these were areas of atrophy or areas of shrinkage, such as are found in the conjunctiva when the iris stroma is being replaced with fibrous tissue, is a matter of conjecture. Examination of the fundus could not be made.

On the neck and chest were many rounded and oval blebs varying in size from 0.5 to 2 cm. in diameter. They were flaccid and reddish blue, looking somewhat like a blood blister. On the hard palate were five areas from 3 to 6 mm. in diameter which had the appearance of blisters after the fluid had escaped; i. e., the covering epidermis was pressed back in place. There was an offensive fetid odor to the patient.

The Wassermann reaction of the blood was negative, and a careful physical examination revealed nothing of significance aside from the observations given. Conjunctival smears showed a few gram-positive diplococci. Blood counts showed a slight anemia; red blood cells, 4,100,000; white blood cells, 7,800; polymorphonuclears, 63 per cent, and lymphocytes, 37 per cent; no eosinophils were found.

Five weeks after the first visit, while the patient was still under observation and symptomatic treatment, the ocular condition had become worse, whereas the skin bullae had almost entirely disappeared. The left eye was almost closed because of adhesions between the palpebral and bulbar conjunctiva, and an examination of the globe was impossible. The right pupil was pulled toward the grayish areas described. The vision of the right eye was ability to count fingers only. The vascularized membrane almost completely covered the cornea and a symblepharon had formed. The patient looked sick, was listless, apathetic and asthenic and had lost about 20 pounds (9 Kg.) in weight.

Following this visit, he did not return, and all efforts to locate him were unsuccessful. Six weeks later, I was informed by the coroner that he was dead. I was not able to secure either eye for microscopic study. He was supposed to have died of some form of diarrhea.

CONCLUSION

Pemphigus of the conjunctiva occurs and is associated with true pemphigus of other parts of the body. It may occur in an acute fulminating form, as in the case reported or in a chronic form. The etiology is obscure, and not one certain causative factor is known. There is no definite course or duration of ocular pemphigus, and treatment is of no avail.

HERPES ZOSTER OPHTHALMICUS LUETICA*

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Herpes zoster of the ophthalmic division of the fifth nerve is a subject which has received much mention in medical writings. Its etiology, however, has been vaguely discussed, and the important rôle played by syphilis has been seriously overlooked.

The nervous origin of herpes zoster was announced by von Bärensprung [1] in 1861, and he proved it further by postmortem examination a few years later. Though his anatomic conceptions of the posterior root ganglions were incorrect at this time, the pathologic localization was permanently established.

Herpes zoster opthalmicus was first described by Jonathan Hutchinson [2] in 1866, and since that time the literature has elaborated itself so extensively that I shall not attempt a review of it. Only such papers as are pertinent to the specific origin of the condition will be quoted in this paper.

The trigeminal nerve is called a mixed nerve, though its motor root is so distinct and separate that it really could be considered a separate cranial nerve. The sensory portion as concentrated in the gasserian ganglion is a fusion of posterior root ganglions of all the posterior sensory roots corresponding to all the motor nerves from the brain stem. It is therefore the great sensory nerve of the head. It enters the pons about midway between its lower and upper borders and sends a short ascending (mesencephalic) root upward through the brain stem and a descending (bulbospinal) root as far down as the second cervical level. The ophthalmic or first division arises from the gasserian ganglion in the middle fossa of the skull, passes thence into the cavernous sinus, and runs along its lateral wall. Here it is joined by sympathetic branches from the superior cervical ganglion (carotid plexus). It then divides into three main branches: (*a*) lacrimal, which anastomoses with the facial nerve (pars intermedia of Wrisberg);

* Submitted for publication, March 10, 1930.
* Read before the Section of Ophthalmology, New York Academy of Medicine, Jan. 20, 1930.

1. Head and Campbell: Brain **23**:351, 1900.
2. Paton, L.: Trigeminal and Its Ocular Lesions, Brit. J. Ophth. **10**:305, 1926.

Paton suggested that the fifth nerve controls the reflex secretion of tears, while the seventh controls emotional weeping; (*b*) frontal, which becomes the supra-orbital, and (*c*) nasociliary, which is the main sensory nerve to the eyeball. The frontal branch is essentially concerned in herpes zoster, and its sensory distribution over the forehead as far back as the vertex is the area usually involved in the herpetic lesion. Of interest is the nasociliary branch about which a certain amount of discussion has arisen. Certain authors consider that the eye rarely suffers unless this branch is involved, while other competent observers refute this statement. The involvement of this branch is readily noted because of the extension of the herpetic eruption downward over the bridge of the nose to its tip.

The localization of the pathologic process in the ganglion is by now a well established fact. Round cell infiltration of the gasserian ganglion has been found in a large series of careful pathologic studies, notably by Head and Campbell,[1] Immerman [3] and others. Some have noted changes in the nerve fibers adjacent to the ganglion, but a constant pattern has not been determined.

Certain authors consider that the virus of the disease may run along the sensory nerves to the ganglion, having entered through the skin or mucous membranes, but my experience with epidemic encephalitis would permit a theory of infection of the blood stream to hold preference.

Quoting S. Lodge and W. Lodge,[4] who affirm an incidence of 1 : 10,000 cases of herpes zoster ophthalmicus, they noted a division by Poulard [5] into three distinct forms: (1) a neuritic form which affects the peripheral branches of the ophthalmic division, (2) a rhizomeric form which implicates the gasserian ganglion and (3) a metameric form the lesions of which lie in the pontomedullary nucleus of the trigeminal nerve. Whether such a further anatomic subdivision is possible cannot yet be substantiated by pathologic observations.

Clinically two main types of the disease can be differentiated, epidemic and symptomatic. The epidemic form is seen as a symptom of such diseases as varicella, encephalitis and poliomyelitis, and it usually occurs during the spring and summer months. The symptomatic form may appear as an accompanying manifestation of a tuberculous or syphilitic meningitis, a basal or spinal cord fracture, a pontile tumor or tabes dorsalis. Of particular interest to me is the latter type, for

3. Immerman, S. L.: Herpes Zoster in Tabes and General Paresis, J. A. M. A. **68**:1607 (June 2) 1917.

4. Lodge, S., and Lodge, W. O.: Herpes Zoster Ophthalmicus, Brit. M. J. **1**:1084, 1923.

5. Poulard: Ophthalmologie dans la pratique medicale, Paris, A. Maloine et fils, 1922, p. 265.

though a syphilitic etiology is obvious when associated with a syphilitic meningitis or tabes or dementia paralytica when it stands alone, it is not so obviously symptomatic in type, and therefore is liable to be overlooked.

Though the herpetic lesion in these cases is the outstanding picture, associated disturbances are frequently observed. In a group of 158 cases, Hunt [6] observed 24 patients with paresis of the ocular muscles, while 80 showed facial paresis; of this group 64 per cent showed some associated paralyses in the nervous system. Lloyd and Elliot [7] noted 7 per cent with either ptosis or paresis of the ocular muscles, while Paton stated that an optic neuritis is rare and that oculomotor paralyses usually occur in the third nerve, rarely in the fourth or sixth nerve. The eye is frequently involved as part of the disease process. The cornea, according to Paton, is affected in 35 per cent. The globe may become affected, especially when the nasociliary branch is involved, occasionally progressing as far as a phthisis bulbi. Iridocyclitis may occur, and a diminished intra-ocular tension may be seen also. Paton [2] presented a splendid consideration of the ocular complications and treatment of ophthalmic herpes zoster, and a thorough study of this paper is advised for those who wish further knowledge of this phase of the subject.

Some authors report that bilateral involvement is not seen, but Parounagian [8] quoted Lipschütz as having seen a bilateral herpes zoster frontalis. Trigeminal herpes zoster is usually confined to the first branch, the second and third branches rarely showing it. Herpes zoster is seen mostly on the trunk, 76 per cent of the cases occurring in that distribution. Generalized herpes is seen (Parounagian), but it is questionable whether this is not a herpes simplex rather than a true ganglionic disease—herpes zoster. The latter author attempted to decry any association with varicella, though more recent studies seem to confirm frequently this relationship.

Jullien, in 1894, first called attention to the connection between herpes zoster and syphilis (Proust [9]), while since that time there have been numerous casual references to this association. Head and Campbell [1] noted that dementia paralytica undoubtedly disposes to zoster due

6. Hunt, J. Ramsay: The Paralytic Complications of Herpes Zoster of the Cephalic Extremity, J. A. M. A. **53**:1456 (Oct. 30) 1909.

7. Lloyd, J. H., and Elliot, B.: A Case of Herpes Zoster in the Distribution of the Inferior Maxillary Nerve Associated with Facial Paralysis, Internat. Clin. **1**: 132, 1924.

8. Parounagian, M. B., and Goodman, H.: Herpes Zoster Generalisatus, Arch. Dermat. & Syph. **7**:439 (April) 1923.

9. Proust, Roger: Zona ophthalmique, Paris Thesis, 1919-1920.

to toxins in the circulation therefrom and from vascular changes and general debility and cited cases with autopsy to prove this assertion. Allbutt,[10] in 1910, said that dementia paralytica undoubtedly predisposes to zoster, while Immerman [3] described two cases of dementia paralytica with positive Wassermann reactions of the spinal fluid in which late in the disease, ophthalmic herpes zoster developed from which the patients recovered. One of the cases which later came to autopsy showed a fibrosis of the ganglion with round cell infiltration. Proust [9] quoted another case of Dupan in which the patient was suffering from paresis; postmortem examination revealed a lesion of the trigeminal nerve.

The prevalence of herpes zoster among a large group of soldiers was noted by Brown and Dujardin [11] as being more so in those under observation for syphilis, 4 in 1,000, while in the general population it was 1 per 1,000. They emphasized the predilection for the lumbar and sacral regions and considered that the disease spreads from the meninges to the spinal ganglions. They brought out that many cases show a lymphocytosis, an increase in globulin and some a positive Wassermann reaction of the spinal fluid. They mentioned only one supra-orbital case, in which the Wassermann reaction of the spinal fluid was negative. They concluded with an interesting observation, namely, that a careful study of the spinal fluid in cases of chickenpox as well as in those of large pox and herpes zoster, may reveal illuminating information.

Schaller [12] reviewed seventy-nine cases of herpes zoster in twenty-one of which spinal puncture was done. In all but one of the latter there were signs of syphilis, though a positive serologic test was not uniform. Only one of these was a case of ophthalmic herpes in which a history of a chancre was given, though the Wassermann reaction of the spinal fluid was negative; one was a case of maxillary herpes in which all tests for syphilis were negative.

Rollet and Colrat [13] reported a case of left ophthalmic herpes with increased spinal fluid pressure, lymphocytosis and globulin increase, though the Wassermann reaction was negative. An optic neuritis was associated, and they concluded that it is undoubtedly a case of syphilitic herpes zoster.

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10. Allbutt: System of Medicine, New York, The Macmillan Company, 1910, vol. 7, p. 475.

11. Brown and Dujardin: Brain **17**:86, 1919.

12. Schaller, W. F.: Spinal Fluid Findings in Herpes Zoster, Calif. State J. Med. **16**:453, 1918.

13. Rollet and Colrat: Ophthalmic Herpes Complicated with Optic Atrophy, Lyon méd. **139**:464, 1927.

Proust [9] cited a case of left ophthalmic herpes zoster and left oculomotor nerve paralysis. The Wassermann test was positive in the blood and spinal fluid. He also cited another case of left ophthalmic herpes with a positive Wassermann reaction and no report on the spinal fluid, and finally a case with a positive Wassermann test of the blood, the spinal fluid showing lymphocytosis, hyperalbumosis and negative Vernes reaction, probably a case of early tabes with ophthalmic herpes.

Townes [14] reported an interesting case of left ophthalmic herpes zoster in a man 59 years old. A positive Wassermann reaction of the blood and spinal fluid was present, but pain was so severe that operation was performed on the ganglion. A severe basilar meningitis was encountered obscuring the field and preventing conclusion of the cutting of the nerve root.

Such observers as Osterroht,[15] Boner,[16] Proust, and Brown and Dujardin emphasized strongly the fact that the appearance of herpes zoster during any period of syphilis should be a warning of a possible nervous lesion, spinal fluid estimations being stressed by the last two observers, while vigorous antisyphilitic treatment is urged by the earlier writers.

My own personal experience leads me to cite briefly two significant cases.

REPORT OF CASES

CASE 1.—L. A. E., a man, aged 38, came to me in 1925 suffering with severe pain over the left side of the forehead, which began three weeks previously, associated with an extensive herpetic eruption over the forehead, extending up into the hair. The pain was then beginning to abate somewhat, but the patient was weak, having fainted the day before.

Physical examination presented the remains of a herpetic eruption over the ophthalmic branch of the left trigeminal nerve. Over this area there was also considerable hyperasthesia. Careful examination of the nervous system failed to reveal any further signs of involvement. The Wassermann reaction of the blood was ++++. A Wassermann test of the spinal fluid was not made. Owing to the patient's circumstances, he was referred to the hospital, where two injections of arsphenamine were given. Rapid recovery was noted, and the patient disappeared beyond follow-up.

CASE 2.—R. S., a man, aged 48, was seen on Jan. 15, 1929, with a history of sudden onset of severe pain in the right side of the upper part of the face and in the right eye accompanied by a herpetic eruption which spread over the forehead and up into the hair. There was marked photophobia, injection of the conjunctiva and edema of the upper lid. Paresthesia was present and intense hyperesthesia to the slightest touch. The pain was so severe that morphine was required.

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14. Townes, C. D.: Herpes Zoster Ophthalmicus, Kentucky M. J. **26**:480, 1928.

15. Osterroht: Ophthalmic Herpes, Samml. zwangl. Abhandl. a. d. Geb. d. Verdauungs- u. Stoffwechs.-Krankh. **7**:1, 1907-1909.

16. Boner, Leon: Syphilitic Herpes, Paris Thesis, 1917.

Physical examination showed the remains of a few herpetic lesions over the right eye. There was deep scarring from old healed lesions over the forehead and into the hair. The eye was swollen and red and was sensitive to light. The skin over the forehead was inflamed and swollen, while throughout the ophthalmic sensory area, including the area slightly down over the right side (nasociliary branch), there was anesthesia to pin prick and touch. There was absence of other neurologic signs. The Wassermann test of the blood was negative. The spinal fluid showed 12 cells; globulin, +++; sugar, 758 mg. The Wassermann reaction of the spinal fluid was ++++; the colloidal gold curve was 0012210000. Treatment with arsphenamine was immediately started, and after two injections the pain entirely disappeared. After two months of intensive arsphenamine therapy with occasional spinal drainage, the spinal fluid showed 8 cells, globulin, ++; Wassermann test, +++; colloidal gold curve, 123210000. At this time there was severe itching over the eye with paresthesia at times. No pain was present, and the area of anesthesia had diminished to about 2 inches (5.08 cm.) in diameter between the eyebrow and hair line.

In all, twenty injections of arsphenamine were given over a period of five months. The patient on his return from abroad in the fall had another spinal puncture. This showed 4 cells; globulin test negative; Wassermann test negative; colloidal gold curve negative. No further treatment was given, as a complete recovery seemed to be accomplished. Only a spinal puncture will be done as a recheck in a six months' period.

The first patient, whom I admit was incompletely studied because of lack of cooperation, had a less severe case of herpes zoster opthalmicus. No evidence was determined of a cerebrospinal syphilis; however, I am convinced that if a spinal puncture had been done, it would have been positive. The second case was characteristic of its kind, showing complete involvement, including the nasociliary branch. The negative Wassermann test of the blood would have been entirely misleading without a spinal fluid. This case showed in the lymphocytosis, increase of globulin, positive Wassermann test and alteration in the gold curve, irrefutable evidence of neurosyphilis. Treatment was carried out with complete cooperation by the patient, and a recovery was thereby brought about.

COMMENT

From a review of the literature and from my own two cases it is obvious that the reported instances of herpes zoster ophthalmicus caused by syphilis are rare, only eleven authentic cases being on record to date. However, most of the cases of this disease are incompletely studied, and if a Wassermann test of the blood and spinal fluid is made on all patients with herpes zoster of the symptomatic type, an astonishing number of cases with a syphilitic etiology will be revealed.

Just what the lesion is in these cases is uncertain. Most cases show a severe form of the disease, but rarely is there a true meningeal headache, nor is the lymphocytosis such as would suggest basilar meningitis of a syphilitic type. I should be inclined to feel that the lesion was

essentially a ganglionitis with possibly an associated radiculitis accounting for the marked sensory changes which accompany this syndrome.

I do not wish to conclude without mentioning the treatment. It does not differ in any way from the usual therapeutic approach to any form of cerebrospinal syphilis. Vigorous treatment with intravenous injections of arsphenamine, intramuscular injections of mercury and, if desired, bismuth, should be employed until the Wassermann test of the blood is negative and until repeated examinations of the spinal fluid reveal a negative cell count, globulin and Wassermann test.

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RETINITIS PUNCTATA ALBESCENS*

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The interesting and typical case to be reported was seen at my clinic at Wills Hospital.

REPORT OF CASE

A woman, aged 20, of Jewish parentage, born in Russia, who came to this country seven years before she was seen at the clinic, until recently had been doing clerical work. Her chief complaint was headaches, especially in the vertex, worse toward the close of the day, and accompanied by a heavy feeling in both eyes. She also complained of inability to see well at night. She had never worn glasses.

She stated that at the age of about 5 years, her mother took her to a physician because she could not see in the dark. He was told about the condition, but the patient received no treatment. She believed that the condition had somewhat improved, as she did not have as much trouble as formerly, although her dark adaptation was apparently delayed, because she had difficulty in finding a seat in the movies, and she was fearful of her steps after nightfall in going into places to which she was unaccustomed. After ten or fifteen minutes in a darkened room, the condition was somewhat relieved.

The only disorder of the eyes from which the patient had suffered was during an attack of "hay-fever" in August, 1928, during which the eyes were red for six weeks, with burning and itching.

As a child she was sickly, and had scarlet fever and diphtheria while in Europe. She had no illness since coming to America, and her general health was good.

She was next to the youngest in a family of four children, there being two sisters and one brother. These had been examined since the patient was first seen, and abnormal changes in the eyegrounds had not been noted. One sister and her brother wore glasses, as did her father and mother, who were first cousins.

Examination.—The eyes, lids and sacs, the conjunctivae, the corneas and the anterior chambers were normal, as was also the ocular tension; the irides were grayish blue and reacted normally.

Ophthalmoscopic examination revealed that the media in each eye were clear, and the disk round with well defined margins; there were central physiologic cups. The color was normal.

The fundi were slightly tesselated, and throughout their whole extent, even to the periphery, were small, rounded, dumbbell-shaped or irregular, white, non-pigmented spots in the deeper layers of the retina, as the retinal vessels could be seen to pass over them. Both maculae were free from these spots.

Vision in the right eye was 6/9 —1; in the left eye, 6/9 —4. Refraction under mydriasis gave: in the right eye, with a +2.25 sphere with +1.00 cylinder

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* Dr. Alfred Cowan made photographs of the eyegrounds.

* Read before the College of Physicians of Philadelphia, Section on Ophthalmology, April 19, 1929.

axis 75 degrees gave vision of 6/6; in the left eye, with a +1.50 sphere with +1.50 cylinder axis 80 degrees gave vision of 6/6.

The visual fields, taken on the Ferree-Rand instrument under 7 foot candle power illumination (fig. 1), showed a slight contraction for form and a decrease in the color fields; if taken under 3 foot candle power illumination (fig. 2), a more marked contraction of the form field was apparent, as can be seen in the accompanying charts.

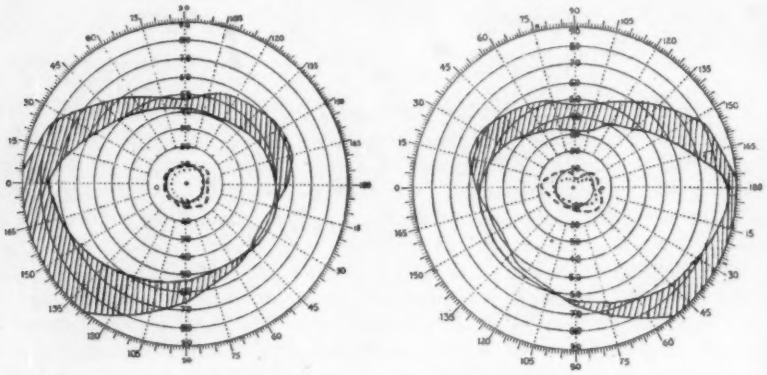

Fig. 1.—Visual fields taken with the Ferree-Rand perimeter on March 11, 1929, under 7 foot candle power. The patient recognized all 1 degree colors. There was no central scotoma. The visual field on the right is for the right eye; that on the left, for the left eye.

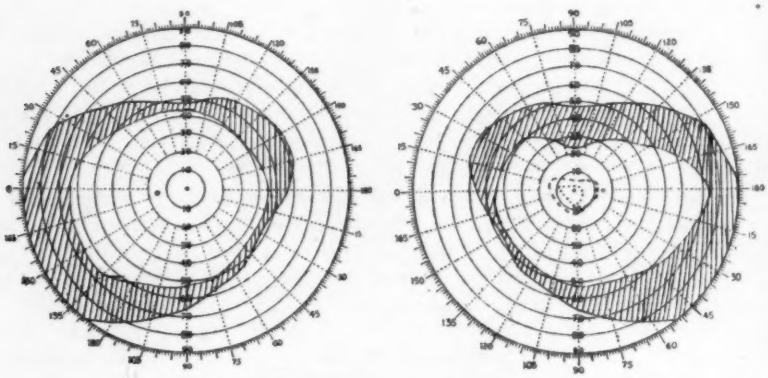

Fig. 2.—Visual fields taken with the Ferree-Rand perimeter on March 11, 1929, under 3 foot candle power. The visual field on the right is for the right eye; that on the left, for the left eye.

Urinalysis gave negative results. The reaction was acid; the specific gravity was 1.026; no sugar or albumin was found.

The differential blood count showed: polymorphonuclears, 62 per cent; small lymphocytes, 30 per cent; large lymphocytes, 3 per cent; transitionals, 4 per cent; mononuclears, 1 per cent, and eosinophils, 0. Chemical analysis of the blood

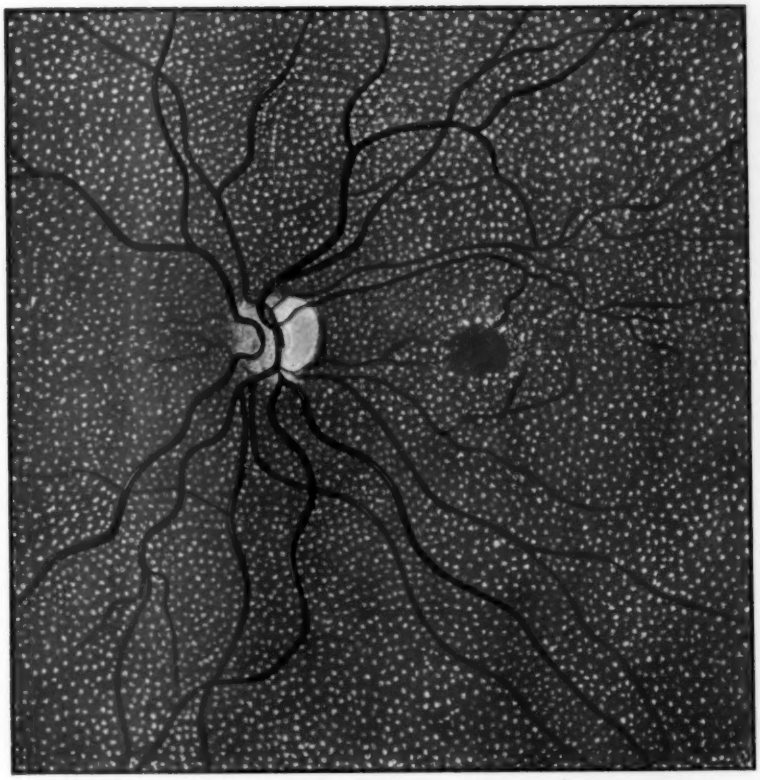

Fig. 3.—Appearance of the left eyeground. The right is exactly similar.

showed: urea nitrogen, 12; urea, 25.5; uric acid, 3.8; creatinine, 1.3, and sugar, 87.5 mg. per hundred cubic centimeters of whole blood. The Meinicke reaction was negative.

The case reported seems to me to be typical of Mooren's retinitis punctata albescens, in that the disease shows a stationary night blindness dating from early life, probably congenital, with a multitude of white spots in the fundus, not accompanied by any pigmentary changes or progressive loss of vision as occurs in retinitis pigmentosa.

The absence of evidences of inflammatory changes, the absence of these spots in the macula of either eye and the symmetrical appearance in each eye point to its congenital nature.

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OCULAR ASPECTS OF CONDITIONED REFLEXES*

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In dealing with the conditioned reflex, consideration must be given to the response mechanism of the individual, which may be divided roughly into three parts: the receptors, the nervous system, including the brain and spinal cord, and the effectors. When a stimulus impinges on a receptor, a neural impulse passes from it to the central nervous system, where certain neural events occur, resulting in an impulse to some effector, the functioning of which constitutes a response. A relatively definite response to a relatively definite stimulus is called a reflex. The common reflex does not involve the cortex and may occur even during sleep. The conditioned reflex, on the other hand, does involve the higher centers.

It has been demonstrated by various physiologists, notably Pavlov, that stimuli may become so intimately associated that the associated stimulus alone produces the same response as the original stimulus. A sensation from any receptor, occurring at a time when a certain part of the cortex is excited and striking that part, may become associated with the other stimuli that are affecting it. This is the basis of the conditioned reflex. The intensity of the conditioned response is often roughly proportional to the number of conditioned stimuli.

Conditioned reflexes may be favorable or unfavorable, and it is often desired to break down the unfavorable ones. This may be done, in general, by conditioned inhibition; that is, by establishing an antagonistic conditioned reflex. What is said relating to astigmatic persons will serve to illustrate conditioned inhibition. The unfavorable conditioned reflex is the one based on the astigmatic person's uncorrected visual impressions. After the astigmatism is corrected, new reflexes, conditioned by the correct visual impressions are formed. These are the antagonistic conditioned reflexes, and they inhibit the unfavorable ones.

The individual is constantly responding to the objects in his environment. He encounters them singly and collectively in all sorts of situations and combinations. He receives visual, auditory and tactile stimuli from them. He encounters them at different times when his eyes are in all their different positions and with all degrees of accommodation and convergence. Thus, various habit systems, composed of

* Submitted for publication, March 11, 1930.

a vast number of conditioned reflexes, are formed, such that if only a part of the original visual combination of stimuli occurs, the absent elements are associatively aroused.

The infant responds to the stimuli of blurred retinal images by accommodation and to diplopia by convergence. In the interest of clear, single, binocular vision, both responses are necessarily made simultaneously, and they gradually become associated. The extent to which each operates is conditioned by a number of factors, such as the length of the eyeball and the state of the media in the case of accommodation, and the distance between the eyes in the case of convergence. Hence, adjustments to the needs of the individual become associatively established. Thereafter, whenever the retinal receptors are stimulated, the kinesthetic receptors in the intra-ocular and extra-ocular muscles are stimulated simultaneously, and the complex of impulses which results intensifies the association of the established habit system. If the demand on either accommodation or convergence is altered, unpleasant subjective symptoms occur until the old association has been broken down and another, conditioned by the changed demand, has been formed. When a firmly formed association, in which accommodation is in excess of convergence, occurs as a conditioned response to hypermetropia, the extra stimuli of corrective lenses are sometimes not sufficient to inhibit the excess accommodation and the diagnosis is spasm of accommodation, latent hypermetropia or pseudomyopia, according to the degree. In such cases, convex lenses are frequently rejected.

Conditioned reflexes are often formed in connection with eye-strain, resulting in many disturbing responses. Eye strain may become associated with the physical and emotional effects of occupation: fatigue, changed endocrine secretion, excitement or other emotional variation. Later these effects occur as the conditioned response to eye strain alone without the original stimuli. An increase in the secretion of epinephrine as a conditioned response to eye strain is the probable cause of nausea and digestive disturbances that occur in cases of refractive error and muscular imbalance.

A twitching or winking of the eyelids as a defense or pain reaction often results from the irritation of conjunctivitis or a foreign body in the eye, and sometimes continues after the removal of the foreign body or the cure of the conjunctivitis. This is a form of conditioned reflex which is considered pathologic by some who recommend the reduction of the sensitivity of the conjunctiva by the use of drugs. In the case of a foreign body in the eye, I find that sleep and the assurance that the difficulty is of a transient nature are usually sufficient inhibitory stimuli to break down this troublesome reflex.

When a patient complains of asthenopic symptoms that occur at some specific time of day, it is probable that a conditioned reflex has

been formed such that the surroundings in which he usually finds himself at that time of day act as a conditioned stimulus and result in the response that is usually made to close work.

Astigmatic persons who have trouble in spatial orientation after correction must break down previously made conditioned reflexes based on their uncorrected visual impressions and must acquire new ones conditioned by corrected visual impressions.

In refractive error, vision is usually improved by glasses, and they may become a favorable conditioned stimulus. In such cases the patient may say that he can see better as soon as the trial frame is put on. Conversely the stimulus of lenses may be unfavorable, as in the case of a little boy who made vigorous fear responses whenever lenses were offered him. Investigation disclosed the fact that older boys had burned his hands with a sunglass, thereby conditioning him against all lenses.

Conditioned emotional reflexes in connection with professional equipment are often found. Pain is usually experienced while sitting in a dentist's chair, and for most people the chair becomes a conditioned stimulus to which negative, avoiding responses are made. The unfortunate resemblance between the dental and the ophthalmic chair results in the same negative responses being made to each. This condition has been observed so frequently that I make use of Windsor chairs to which, it is hoped, fewer unfavorable associations are attached.

The extent to which associated stimuli and conditioned reflexes occur in connection with the eyes is greater than might be supposed. A few of them have been mentioned in this article, but the systematic analyst can discover them in every ocular function. The contribution of the conditioned reflex to hygiene is large. It explains many puzzling symptoms, clarifies the etiology of some cases, points the way to healthful associations, indicates a means of avoiding or overcoming unfavorable ones and provides an objective means for further study.

Clinical Notes

A SCLEROTOME *

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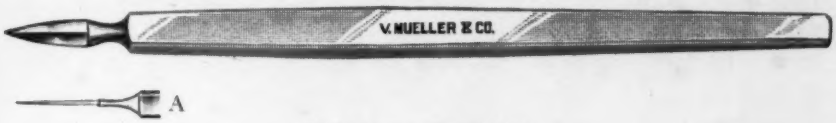
An ideal instrument for scleral incisions to admit the tip of the magnet in extracting foreign bodies from the vitreous chamber should not penetrate too deeply and must be sharp and strong.

When, as is usual, a cataract knife is used for this purpose, it must be plunged at least half its length in order to cut the tough sclera with the middle of the blade. Afterward, if the vitreous is viewed with the slit-lamp, the path of the knife can be recognized as well as the transit of the foreign body across the vitreous body.

In order to obviate unnecessary traumatization of the vitreous and at the same time to obtain a satisfactory, almost painless, scleral incision, I have devised an instrument which enables one to accomplish easily the classic requirements of sclerotomy.



Sclerotome; actual size.

This instrument has the usual eye-knife handle with a blade 11 mm. long and 4 mm. wide at its base, which is stopped. The blade is diamond-shaped, with a strong central axis, beveled laterally to two extremely sharp cutting edges, which converge at a fine point, but at an angle so obtuse as to make deep penetration virtually impossible.

Although designed primarily for scleral incision preliminary to extracting magnetic foreign bodies, experience has proved this knife to be eminently efficient in performing posterior sclerotomies, as well as for the incision of abscesses and for chalazion operations.

The instrument was made according to my specifications by V. Mueller and Company, Chicago.

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Ophthalmologic Review

BLEPHARITIS

ETIOLOGY AND TREATMENT *

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The field of the disease indicated in the title is limited today to acute or chronic inflammations of the palpebral or ciliary margin. The anatomy of this region is of great importance in the analysis of clinical symptoms and in differential diagnosis. The use of the magnifying glass, or better, the binocular (corneal) microscope is most instructive and of great value. There is a certain variety in the dimensions of the normal palpebral margin. Thin lids with few lashes, or, on the other hand, thick lids, indicate a tendency to blepharitis. The normal palpebral margin shows two zones separated by a fine linear trace of slightly deeper grayish tone. Terson calls this the intermarginal linear zone. In predisposed and actually diseased subjects, this zone tends to disappear. The anterior (cutaneous) zone is congested and under the loupe shows fine vascularization. The posterior (tarsal) is redder and vascular, and presents irregularities of the surface and a more or less granular appearance under the microscope. Normally, the anterior zone presents three or four irregular rows of cilia, occupying a band 2 or 3 mm. wide, which are stiff and strong, slightly curved, sharply pointed and flattened. The young cilia are highly pigmented and have the form of a button (Knopf-Haare); the adult hairs are lighter and more club-shaped. They attain maturity and fall out in from one hundred to one hundred and fifty days. The new lashes attain full growth, from 6 to 8 mm., in ten weeks. After epilation the new growth takes place at about the same rate. In blepharitis it seems to be accelerated.

ETIOLOGY

Blepharitis represents an inflammatory condition of one or more of the constituent elements (skin, cilia, follicles, glands of Zeiss, Moll and Meibom) of the palpebral margin and is to be considered a local-

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* Report presented to the Société Française d'Ophtalmologie, May, 1929.

ized dermatitis or dermatosis. As a transition zone from skin to mucous membrane it also takes part in conjunctival diseases, particularly those of lacrimonasal origin. Hyperemia and itching are common symptoms of blepharitis of the cutaneous portion. These may be primary and due to local irritation or they may be the expression of such systemic disturbances as renal or hepatic insufficiency, diabetes, jaundice, gastro-intestinal autointoxication or obstinate constipation. They are more noticeable after indulgence in rich food or wine, overwork, loss of sleep, and, ot course, on exposure to wind, dust, bright light or a smoky atmosphere. Fugitive erythemas are common. They may be due to mechanical injury, heat, cold, bite of insects, chemical or toxic irritation, microbic infection, allergic sensitization, anaphylaxis from food sensitization, autointoxication in gout, diabetes or intestinal putrefaction, and they indicate a special idiosyncrasy. This applies particularly to angioneurotic edema and urticaria involving the hairy scalp and eye brows and often the lids. As is well known, a large number of drugs or foodstuffs may evoke an acute attack in susceptible persons, and in a given case careful eliminative tests by intradermal reactions are required to detect the cause. Quinine, morphine, arsenic, iodides, bromides, chloral hydrate, and balsamic preparations, on the one hand, and fish, lobsters, crabs, shellfish (particularly mussels), smoked meats, preserves, cheese, strawberries, buckwheat, sausage, tea and coffee, on the other, are the commonest factors. That susceptible persons have a special type of skin, an actual predisposition, is probable. This may have an hereditary basis, or be due to acquired disease, faulty ways of living, excessive use of wine or liquors or gastro-intestinal disturbances and unsuitable diet. The hereditary factor may be that of obesity, gout, rheumatism, asthma or migraine. Tuberculosis in the attenuated form of lymphatism or the exudative diathesis of Czerny must be considered, and syphilis plays a rôle in scrofula as well as in various dyscrinisms and disturbances of nutrition. In eczematous blepharitis the rôle of alimentary intoxication is often striking. Abuse of the use of stimulants, highly seasoned, too rich or badly cooked food, alcohol, coffee, tea or tobacco or, on the other hand, lack of good, nourishing food, combined with physical or mental overwork and emotional stress, are common antecedents. Various dyspepsias, gastro-intestinal catarrhs, chronic appendicitis, disease of the gallbladder and constipation, in fact anything that tends to cause faulty metabolism, intestinal fermentation or improper elimination, has etiologic significance, particularly in children and infants. Disturbances of dentition, carious teeth and pyorrhea may be mentioned, as also focal infections in the tonsils, sinuses, appendix, gallbladder, prostate or uterine adnexa. Finally, the rôle of the endocrine glands must be considered, particularly the thyroid and gonads, as

well as all glands participating in the development of the organism and in general nutrition. This is indicated by the incidence of blepharitis at critical sexual epochs—puberty, menarche, pregnancy, lactation, puerperium and menopause—physiologic or operative.

Local Causes.—Trauma plays a striking part. Rubbing of the lids or repeated wiping as in lacrimation or for relief from a freely secreting conjunctiva, particularly if done with dirty fingers or a soiled handkerchief, is a common predisposing and exciting cause. This is particularly noticeable in itching conditions. Irritating conjunctival secretions (kerato-conjunctivitis phylctenulosa) may be an added factor in children, as well as the spastic closure of the lids from photophobia, the burrowing of the head into bedding or clothes and the convulsive pressure of the fists against the closed lids. Infants often carry saliva to the lids after sucking their fingers. Bright light or intense heat may produce erythema or eczema. Hot poultices, particularly if medicated, even boric acid, and notably the alkaloids, atropine, eserine and, less markedly, cocaine are irritating to susceptible lids. Even mercurial and sulphur ointments, so valuable in dermatology, may be badly borne. Many toilet preparations and cosmetics, particularly mascara and hair dyes made of aniline colors (paraphenylendiamine), are decidedly irritating to the lids. As to micro-organisms, it is probable that their etiologic significance has been overestimated and that the bacterial flora of inflamed palpebral margins are generally saprophytic or in the nature of secondary infections. This is striking in the common cases of actual inoculation into the palpebral margin of the virus of vaccination pustules, or the pustular lesions of measles, smallpox and other acute eruptive diseases of childhood. Impetigo is generally carried to the lids from the face, lips, nasal orifice or ears. It is characterized by "pustules or purulent bullae, inoculable or auto-inoculable, developing rapidly (ab impetu) in healthy skin, drying into crusts which are often yellow, of honey or soft wax consistency, under which the epidermis is merely eroded, healing quickly, and leaving no trace." (J. Darier.)

Contagious impetigo often appears almost exclusively in childhood in the form of family or school epidemics, after chickenpox or measles or at the time of vaccinations. Adults may, of course, become infected or carry the virus to their own lids with fingers, soiled towels, etc. Streptococci are the responsible mico-organisms, according to Sabouraud (confirmed by Benda and Lewandowsky).

Psoriasis, with its red nodules and many patches covered with squamous scales may, though rarely, involve the palpebral margin, as is the case with bullous dermatitis, notably pemphigus. The latter may be acute or chronic, benign or malignant. The contagious epidemic pemphigus of the new-born child is nothing but a bullous impetigo

(J. Darier), and rarely attacks the face. In malignant pemphigus, which is hard to differentiate from the benign form in the early stages, the bullae may invade the face, lids and ciliary margins. The lesions also involve the conjunctiva, and ulceration followed by cicatricial contracting bands shrink the culdesac and cause adhesions and deformity of the lids with serious complications of the surface of the globe. Finally the cornea is completely destroyed and xerosis develops with total blindness. Vesicles of herpes simplex or herpes febrilis may appear on the palpebral margin or commissures (von Michel). The lesions may also be noted on the skin of the lids and notably on the cornea and conjunctiva, but they do not seem to have any important rôle in causing blepharitis. Blepharitis of the sebaceous glands of Zeiss may be present as an oily or as a dry seborrhea. Hypersecretion of a fatty nature dries rapidly on exposure, producing yellow or yellowish-brown crusts like honey or soft wax. These dry crusts often cause the condition to be mistaken for seborrhea sicca or squamous blepharitis, and may contain epidermic scales and cilia (seborrheic eczema of Unna). It is a disease of such regions as the eyebrows or hairy scalp. In all of these regions the hairs are lax and shiny and leave an oily trace on paper. Dry blepharitis (seborrhea sicca) has less to do with the glands themselves. It is a squamous, scaly condition characterized by a fine white powder or scurf, like dandruff, composed of scales, which covers the lashes as it does the eyebrows and hair of the scalp. This dry form, in marked contrast to the oily seborrhea, is exceedingly obstinate and resists treatment. It may last, with slight improvement for a short time, from infancy to advanced old age. It is this form which has been attributed in part to refraction errors, continual close work, excessive or faulty illumination and lack of sleep, in short, eyestrain. Sabouraud (1897) described the micro-organism of seborrhea as a small, somewhat curved, club-shaped bacillus. It is a facultative anaerobe and probably identical with the bacillus of acne (Unna, Hodara). As in this disease, accumulation of epithelial débris and sebum may produce plugs of greasy material in the follicular pore of the lash, and this may progress to the formation of an actual "blackhead" or comedo.

Meibomian Blepharitis.—The seborrhea is characteristically whitish and foamy, appearing under the loupe like a small collection of saliva on the palpebral margin, which accumulates at the two angles. It is generally accompanied by a mild conjunctivitis. The glands here debouch in the vicinity of a mucosa, and this is constantly moist; a similar arrangement is known only of the glans penis in the male and of the labia minora in the female. Gifford classifies the forms of simple hypersecretion and those of chronic meibomitis, simple, hypertrophic and secondary (to chronic conjunctivitis, lacrimal disease,

trachoma) with chalazion or concretions. In simple seborrhea, a soft waxy filament or an oily drop can be expressed from the gland openings of the palpebral margin. In true blepharbitis, there is in addition evidence of actual inflammation, redness, slight pain or itching, feeling of heat or fulness in the ciliary margin of the lids, particularly at the inner and outer canthus. Etiologically one must consider sympathetic vasomotor influences (Kruckmann), endocrine disturbances of puberty, menstrual anomalies, pregnancy and the lymphatic diathesis.

Sudoriparous Blepharitis.—Here one has to deal with the modified sweat glands (Knaeuel druesen) of Moll, which because of arrested development are small and have no glomeruli, and secrete greasy sebum as well as sweat. Infection of the orifice and adjacent parts manifests itself by minute, red, inflammatory papules which develop rapidly and disappear without suppuration or ulceration.

Ciliary Blepharitis.—This form may be spoken of as an infection, as micro-organisms play an important rôle in its causation, frequently leading to ulceration. Here, as in the follicular forms, the intervention of pyogenic germs appears of more importance than the terrain. The terms blepharitis, suppurating or purulent, pustular, folliculitis ciliaris and pyodermatitis ciliaris are applied to various morphologic and clinical aspects of what is essentially one and the same disease. The condition may be localized in the interior of the ciliary follicle or outside in the external sheath and the accessory sebaceous glands of the follicle. In acne vulgaris, the primary involvement is that of the sebaceous gland, the follicle becoming involved later. In sycosis there is a suppurative folliculitis involving the lashes. It is often associated with a similar condition of the beard (f. barbae) or chin (acne mentagra). It begins, according to Unna, with a pustule of the hair sheath. The terms acne and impetigo commonly used for these forms tend to confusion. The inciting agent is *Staphylococcus aureus,* less frequently *S. albus* or *S. citreus.* Falling out of lashes, rubbing the lids with dirty fingers or soiled towels, eczemas of infancy and early childhood are predisposing factors.

Acne Blepharitis.—At present this term is generally limited to a follicular eruption, generally complicating seborrhea and usually occuring at puberty (A. juvenilis faciei). In the more severe form the external hordeolum or sty is recognized, which is so easily inoculated into the opposite lid by contact (Orgelet, Gerstenkorn). Anomalies of sexual development and the corresponding dyscrinisms are held etiologically responsible. The localized acne of young girls, affecting the chin alone and disappearing with marriage, is well known in connection with menstrual disturbances, Basal metabolism is always disturbed. The subjects may be pale and anemic and suffer from tachycardia, hyperthyroidism or hypo-ovarian, or they may be plethoric and obese

and suffer from hypothyroidism. Digestive disturbances, faulty diet and habitual constipation are important predisposing causes. Sabouraud (1900) found in these cases a white staphylococcus which grows easily on acid mediums and gives the cultures an odor of rancid butter (*S. albus butyricus*). In older subjects, *Staphylococcus aureus* is found as a complicating germ; in young subjects, *S. albus* only. Frequent attacks of acne, particularly in corpulent, sanguine, full-blooded persons given to excessive use of liquor, are associated with erythrosis and irregular hyperemia and thickening of the palpebral margin, glands and surrounding tissues, giving the clinical picture of acne rosacea. Here, too, functional disturbances in the genital sphere, menopause, dysmenorrhea, endometritis or diseases of the uterine adnexa are of etiologic importance, as are thyroid and ovarian dyscrinisms, and above all, chronic nasal or accessory sinus infections, dental caries or pyorrhea, and such agencies as continued and extreme heat or cold, dust and wind.

Furunculous Blepharitis.—This condition, a form of sty or cellulitis of sweatglands, represents an especially virulent infection by *Staphylococcus aureus,* either as a primary acute infection or as a complication, a secondary infection of almost any variety of blepharitis. Pasteur identified the microbe of furunculosis with that of osteomyelitis. Inoculated into a rabbit's cornea, it regularly causes an abscess with marked chemosis and hypopyon which may go on to suppurative panophthalmitis. This virulence seems to be more marked in anemic, run-down or convalescent subjects, or in those who are toxic from excessive use of alcohol, gastro-intestinal putrefaction, products of focal infection, or lowered basal metabolism (diabetes, hypothyroidism, etc.). The marked obstinacy and resistance to treatment of furuncles, and their tendency to spread infection via the blood and lymph channels has been attributed to the marked vascularity of these parts and to the activity of the superficial muscles of the lids and cheek. Direct inoculation from one lid to the other by pressure contact is common. In rare conditions of debility or cachexia, furunculosis may take on the appearance of malignant pustules, cross the palpebral margin and extend toward the inner angle with marked inflammatory reaction and swelling and lymphangitis. Orbital cellulitis is a not uncommon complication which occasionally leads to cavernous sinus thrombosis and death.

Acute Infectious Disease as an Etiologic Factor.—Patients with eruptive fevers, particularly measles and smallpox, frequently present palpebral lesions. In the latter disease, vaccinia pustules on the lids are common, and in the prevaccination era 35 per cent of all cases of blindness were due to this malady. The lids are markedly swollen and

tightly closed, so that the pus and crusts are brought into close contact with the eyeball. Corneal ulcer or hypopyon keratitis often results, and loss of the eye is the almost inevitable result. In this, as in all eruptive fevers, there is apt to be an accompanying membranous conjunctivitis. Occasionally this assumes a truly diphtheritic form with dense adherent membranes, the forcible removal of which leaves raw bleeding areas. Vaccinia blepharitis with its pustules and ulcers progresses to complete loss of the cilia (madarosis) with permanent scarring of the palpebral margin. Distichia trichiasis, deformities of the lids, symblepharon and narrowing of the palpebral fissure are not infrequent sequelae of irregular dense scars of the palpebral margin. The condition may become chronic, presenting red, irregularly swollen or thickened palpebral margins, and, at times, fleshy granulations. Vaccine carried to the eyes on dirty fingers or soiled towels and then rubbed into the itching or irritated lids in subjects recently vaccinated produces an actual inoculation which gives the same clinical picture. The frequency of impetigo or eczema of the palpebral margin of infants under similar conditions has already been mentioned. In chickenpox one generally encounters an acute conjunctival catarrh. The surface hyperemia and irritating secretion may involve the palpebral margin primarily or may be secondary complications. In scarlatina, pseudomembranous or diphtheritic blepharoconjunctivitis may leave behind a chronically hyperemic or actually inflamed palpebral margin. However, next to smallpox, now fortunately rare, measles is accompanied most commonly by blepharitis. Conjunctivitis is the usual accompaniment of the first stage and not infrequently the precursor of general clinical manifestations. When the eruption takes place, the lids are red, swollen and inflamed in sympathy with the acute conjunctivitis. In lymphatic, scrofulous children, an aleady existing mild blepharitis becomes persistent and obstinate. These conditions accompanying or following measles have no morphologic or clinical peculiarities. This disease of childhood often precedes other ocular diseases, such as pseudomembranous or lymphatic conjunctivitis, phlyctenular keratitis, eczema or impetigo of the lids. Any and all infectious diseases may cause disease conditions of the palpebral margin by lowering general resistance (grip, angina, diphtheria, etc.) or by way of complicating conjunctivitis (typhus, typhoid) or dermatitis (erysipelas). In the last named infection there may be direct involvement of the palpebral margin, and even in the most benign forms of erysipelas the brows and lashes fall out and a mild infection of the palpebral margin may progress to gangrene and necrosis. In severe cases one finds ugly scars with ectropion, distichia, and trichiasis, but more often the persisting condition is merely a chronic blepharitis with more or less frequent relapses and complications in the nature of sties or chalazazions.

Chronic Infectious Diseases: Syphilis, Tuberculosis, Lepra.—The bacillus of Koch, *Spirochaeta pallida,* and the bacillus of Hansen may be directly responsible for the appearance of blepharitis. In regard to syphilis, of course, a primary secondary or tertiary lesion may be located on the palpebral margin. This form of syphilitic infection will not be considered here as it really has nothing to do with blepharitis. Mucous patches have been seen on the palpebral margins. Specific eruptions and syphilids may cause inflammatory reaction and loss of lashes with temporary or permanent ciliary alopecia. Hutchinson described a true heredospecific blepharitis with punched out ulcerations in the vicinity of the commissures, accompanied by fissures and rhagades such as one sees about the mouth and other orifices in these cases. Gumma of the palpebral margin has been observed in cases of acquired syphilis (Chaillous and Gueneau) and in the hereditary form (de Lapersonne). Likewise secondary papular eruptions located on the palpebral margin may take on the appearance of erythema, acne, impetigo or of vesicular or squamous blepharitis, so that the syphilitic origin is masked; the diagnosis finally is cleared up by the success of antisyphilitic treatment when everything else has failed. As to tuberculosis, besides its obvious rôle in causing a general predisposition, the presence of giant cells in cases of chalazion has encouraged the search for the tubercule bacillus, and this has been found in a few cases, although Henke (1901) claimed that an acid-fast germ of the nature of the smegma bacillus, and not Koch's bacillus, was found. Tuberculous infection of the palpebral margin is almost invariably exogeneous, a direct inoculation. It may come from the adjacent parts, as from a tuberculous rhinitis, coryza, lupus of the face or tuberculous osteitis or periosteitis of the orbit. The bacillus introduced by dirty fingers, soiled handkerchiefs or towels enters the sebaceous or sweat glands. Here the infection rarely takes the form of a true blepharitis but appears as solitary giant tubercles, tuberculous abscesses, miliary tubercles with ulceration or lupus. The last named variety may impress one clinically as blepharitis marginalis. But the presence of lupus patches on the skin of the brow, face and nose will generally clear up the diagnosis. The nodular form of lupus may in its retrogressive stage produce scaly débris (pityriasis). Similiarly, psoriasis and Kaposi's acneform lupus may, exceptionally, involve the palpebral margin.

In lepra, especially in the tuberculous variety, the lids are irregularly infiltrated. The margins, particularly, show scattered nodules or rows of lumps at an early stage of the disease. This has been noted by the earliest observers. Bull and Hansen (1873) had already remarked that loss of brows and cilia was generally the first sign of lepra. Propagation of the lesions of lepra to the episclera, cornea and

iris occurs before long. A chronic obstinate conjunctival irritation produces constant epiphora which still further inflames the swollen, reddened and thickened palpebral margins. The lepra bacillus (Hansen) is found in the tears and conjunctival secretion as well as in the glands of the palpebral margin. The tarsal conjunctiva is invaded and on it appear to have been sown small lepra nodules. Scrapings here show the bacillus in abundance. Loss of lashes, as remarked, is early and often complete. The nodules of the palpebral margin may become absorbed; more often they go on to abscess formation and ulceration and break down, with more or less complete disorganization of the palpebral margin and not infrequently with partial destruction of the lids, especially the lower. Blepharitis, however, is less striking than other ocular and peripheral lesions of the early stage of lepra.

RÔLE OF ANIMAL AND VEGETABLE PARASITES

Phthiriasis or pediculosis of the lids is today more frequent than one would expect, in town and in country, in crowded slums and asylums, and among neglected and dirty children. The louse generally found is *Phthirius pubis,* less rarely *Pediculus capitis.* At times, only the plaques or "lenses" of excrement are seen sticking tenaciously to the lashes. Again, the loupe will show pediculi at the root of the lashes, the beak and head sticking into the opening of the follicle. The presence of lice in lashes of an inflamed palpebral margin does not prove that they are responsible for the blepharitis. In most cases, dirty fingers have rubbed them into the itching lid, and the blepharitis was an antecedent condition; the phthiriasis, an accidental "contamination." The frequency with which lice are found on normal palpebral margins suggests strongly that their mere presence cannot, or usually does not, induce blepharitis, although the itching provoked by them may cause mechanical irritation from rubbing or scratching and may result in a true inflammation of the palpebral margin.

Scabies.—Infection by the itch mite is extremely rare around the face. Raehlmann (1899) noted that follicular and perifollicular inflammations of the palpebral margin may be due to *Acarus* or *Demodex,* and Joerz (1899), Muller (1900) and Huschke (1900) found *Sarcoptes* in sections and epilated lashes. Here, as in pediculosis, the itch mite may be a late importation into a previously inflamed, blepharitic palpebral margin, or its presence and the intolerable itching it causes may result in mechanical irritation and obstinate inflammation. Carron du Villards noted in the Antilles an acarus, related to *Sarcoptes* but redder, which fastened on the palpebral margins and produced minute furrows around the lashes, causing them to fall out, with resultant ulceration and violent itching. Other parasites of the tropical

regions are known to attach themselves to the lashes and lids of hunters in literal festoons, leaving their hooklets behind in the skin when forcibly picked off. In order to get a spontaneous detachment of these little pests the natives bring some heated object, a glowing needle, or a lighted cigar close to the lid. *Demodex* is found in the follicles of even normal lashes with great frequency. Only the sheath of the lash is invaded, and the glands of the palpebral margin are never involved. Folliculitis, however, may be caused by secondary invasion by microbes, especially by the staphylococcus. Raehlmann described an acarigenous blepharitis of great obstinacy with honey-like secretion, but *Demodex* is found as often in normal persons as in those with blepharitis.

Vegetable Parasites.—The commonest molds are those of trichophytosis, favus and certain palpebral dermatomycoses. The spores of trichophytosis penetrate the superficial layers of the lash follicle and develop by conidia, affecting the shaft and root. The mold itself, and above all its toxins, cause an inflammatory reaction with bullae and round cell infiltration of the sheath and connective tissue. The result is a true parasitic sycosis. At times one finds nodular proliferation of connective tissue cells and agglomerations of plasma cells forming pus enclosing débris of dead mycelia. Similar lesions are seen on the eyebrows and beard. The disease is spread to man by animals, particularly the horse, and from man to man. Niclos (1895) reported the case of a trooper who had probably contracted the disease from his mount. Only the outer half of both lids of the left eye was involved. The external canthus was the center of a characteristic circinate zone of inflammation of the palpebral margin about 1 cm. wide. The lashes were glued together by grayish crusts; many were broken, altered or missing. Favus or tinea may involve the palpebral margin, but causes blepharitis only by coincidence or secondarily. The basic lesion, the bucket, cupula or favus scutula of the German authors, from 2 to 4 mm. in diameter, of a sulphur yellow hue, may have its seat in the lashes, which are dull and powdery and fall out easily—although they are not brittle as in trichophytosis—leaving a "bald" palpebral margin (alopecia favosa). The bucket mass contains the spores of *Achorion schoenleinii* (Zurich, 1839). Animal transmission in rural communities and especially in the infant population, is common. It may cause an eczema which yields to treatment but leaves surface scars and permanent loss of lashes. Both the forms mentioned are thread molds (dermatomycoses). Actinomycosis of the face is another similar form which may, although rarely, involve the palpebral margin secondarily. Botryomycosis of the lids of equine origin has been reported (Ten Sietkoff), with small pustules which broke on the palpebral margin and showed yellowish grains on a granular tissue with marked conjunctival chemosis.

Blastomycosis and Yeast Mycosis.—These cause small abscesses around the lashes. This disease, which has been noted commonly by American authors (Wood, Gilchrist, Derby, Buck), is carried by wounds, erosions, scratching etc. Palpebral sporotrichosis was reported by Morax, Carlotti and Fava. Swelling and a violet-colored inflammation of the upper eye lid, with small, yellowish-gray abscesses and ulcerations of the free border occurred, together with signs of lymphangitis leading from the external canthus to the preauricular and submaxillary lymph glands. Epidermal desquamation, superficial ulcers and small, nodular, intradermal abscess are common.

OCULAR DISEASES AND ERRORS OF REFRACTION

In all cases of acute conjunctivitis, the palpebral margin are swollen and red and take part in the inflammation of the tarsal conjunctiva. The lids are glued and the lashes stuck together, especially after sleep, less by the mucopurulent secretions of the inflamed conjunctiva than by the seborrhea and crusty débris (chassie) of the blepharitis. This condition usually clears up with the passing of the conjunctival catarrh, but it may persist in predisposed subjects, especially in relapsing types of conjunctivitis, and may cause conjunctivitis with secretion. The diplobacillus (Morax-Axenfeld) and trachoma are particularly active in this regard. Angular conjunctivitis, with a tendency toward fissures, eczema and rhagades, is well known for its blepharitic complications. In some cases the posterior lip of the palpebral margin, inflamed and swollen, appears as a red binding. This blepharitis marginalis posterior (Aubaret) is found in all varieties of chronic inflammation of the tarsal conjunctiva. It may also be noted in trachoma, but the commoner manifestation is due, indirectly, to attacks of diplobacillus conjunctivitis. Often the trachoma is then discovered for the first time. In later stages, however, the typical sclerosing and cicatricial changes of trachoma extend to the palpebral margin, with chronic inflammation of the hair follicles, scarring and distortion of the palpebral margin, falling out or degeneration of the hairs with resulting trichiasis or distichia. An irregularly thickened palpebral margin and narrowing of the palpebral fissure (phimosis) is common. Chronic "rheumatic" keratitis, torpid ulcers, chronic iritis and iridocyclitis, even glaucoma, chronic or absolute, in aged persons may present blepharitis with obstinate blepharospasm or spastic entropion. Simple inflammation of the lacrimal passages or purulent infection with stenosis or dacryocystitis may result from obstinate blepharitis or themselves be the predisposing or causal factors of a dacryoblepharitis (Aubaret). Disease of the nasal mucosa and turbinate bodies may be detected frequently, and patients with nasal obstruction, chronic catarrh, obstructed breathing, nasal polyps, atrophic rhinitis or ozena, and especially patients

with a lymphatic, scrofulous, heredotuberculous or arthritic habitus, are prone to inflammations of the palpebral margin.

Errors of Refraction.—Sulzer's encyclopedia gives credit to St. John Roosa and Keyser as the first to call attention to the fact that almost all eyes affected with chronic obstinate conjunctivitis or persistent blepharitis are ametropic and usually hypermetropic. (These physicians made this statement at the New York Congress of Ophthalmology in 1876.) They claimed that not merely hyperemia of the palpebral margin but actually ulcerative forms were due to errors of refraction. Their opinion was not generally accepted. About the same time, Badal showed a similar relation between errors of refraction and lacrimal disease. Hael (1882) included astigmatism in the etiologic factors, and this appeared to be supported by the statistics of Clark (1894). Martin (Bordeaux) and a few other authors (Richt, Hotz, Winselmann) add keratitis, lacrimal disease and even cataract to the ocular maladies that are to be attributed to ametropia. Finally, Sulzer explained the blepharitis of eyestrain by asthenopia, ocular fatigue and reflex congestive disturbances in the circulation of the palpebral margin. Von Michel believed the relation fortuitous, as he found emmetropia as frequently as errors of refraction in blepharitic subjects. Knies (1894) found them to be myopic as often as hypermetropic, and Schreiber (1924) claimed that blepharitis is no more common in ametropia than in emmetropia. Sulzer supplied an intermediate factor in rhinopharyngitis due to astigmatism and claimed that it was responsible also for various ophthalmias, scrofulous keratitis and chronic conjunctivitis. There has been much generalizing, but the fact seems to be that in persons with astigmatism and ametropia, as in patients with other diseases, there is a variety of etiologic factors, constitutional as well as local, to explain the blepharitis. It cannot be denied, however, that full and accurate correction of ametropia, spherical as well as cylindrical, is often followed by amelioration of symptoms or even the cure of a person with a previously rebellious blepharitis. This is more than coincidental. Whatever the constitutional peculiarities common to persons with ametropia and blepharitis, it appears beyond question that visual troubles, eyestrain, asthenopic crises and prolonged close work under unfavorable conditions of illumination are causes of persistent irritation of the eyes and lids. Whatever the opinion as to the curative power of glasses, all agree the errors of refraction should be carefully corrected and that at least improvement of the blepharitis will be noted in a certain percentage of cases.

TREATMENT FOR BLEPHARITIS

The multiplicity of etiologic factors indicates the difficulty and complexity of therapeutics. One must consider preventive measures of gen-

eral and local hygiene and actual curative procedures, either local (external) or general (internal). In many cases of mild blepharitis the patients require and desire practically no treatment. In others the subjective symptoms of heat, itching or actual stabbing pain are severe, in spite of apparently nearly normal anatomic conditions. For many girls and young women the question is largely one of vanity. The cosmetic defect due to red lids and falling or scanty lashes, rather than any unpleasant symptoms, is the principal complaint. Finally, many persons with blepharitis consult an oculist only when their simple eczema or seborrhea is complicated by attacks of acne, sycosis, furuncle etc.

Prophylactic and Hygienic Treatment.—This is of great practical importance. Many persons with blepharitis have learned what external agencies or constitutional disturbances bring on attacks of blepharitis or aggravate already existing morbid conditions of the palpebral margin. They learn to avoid them and do not apply for treatment.

Local Hygiene.—All patients are benefited, and many greatly improved, by simple measures of protection and cleanliness. Mechanical removal of minute foreign bodies, dust, etc., washing the eyes after exposure to wind and dirt, particularly before retiring for the night and careful cleansing of "sleep" or crusts on the lashes are naturally, the first precautions to be taken. Extremes of heat and cold, to which inflamed lids are particularly sensitive, must be avoided, as well as a stale smoky atmosphere, close rooms, irritating vapors and, above all, tobacco smoke and gasoline fumes. When these factors are combined with bright light or close work, as in theaters, at dances, night clubs, and so on, such precautions are essential. In severe cases, smoked or colored goggles may have to be worn if this is impossible. Dry, superheated air, as in most forms of central heating, and cold, damp air, as in fog, and icy wind, may be equally bad for sore lids. Wind and dust are, after all, the most irritating agencies. In certain regions and in motor travel, particularly in touring cars, these may be a real torment for sensitive subjects, and protective glasses should be worn. Prolonged close work at night or with faulty or excessive illumination, fine needle-work, miniature painting, small scale mechanical drawing, engraving, in fact any occupation involving accommodative or fixational strain should be reduced to a minimum. It is in these cases that the beneficial effects of careful correction of ametropia and ocular muscle imbalance are noted with satisfaction by patient and physician. Unfortunately, many young people are so vain that they object to glasses and prefer to use cosmetics, themselves often irritating, to mask the blepharitis, and, as they think, to improve the appearance of their lids. The lid pencils made with lamp black, generally used, are not irritating, but kohol (mascara) imported from the East, in the form

of a powder made by incomplete combustion of greasy matter, contains small grains of foreign substance or even flakes and crystals of various salts and is often mechanically as well as chemically irritating to the conjunctiva as well as to the skin of the palpebral margin. Hair dyes and tonics, particularly if they contain paraphenylendiamine, either cause actual hyperemia and inflammation or induce these reactions by causing itching and heat, with resulting rubbing and mechanical irritation of the lids. Dirty fingers and soiled towels must be kept away from the eyes. Chauffeurs, engineers and sailors, as well as those vocationally exposed to heat (glass-blowers, blacksmiths, forge and foundry workers, and others) need special hygienic care. Young children and infants invariably rub the eyelids, if inflamed, and this may have to be prevented by pinning down the sleeves or putting the arms in pasteboard tubes.

General Hygiene.—While some patients require complete rest, physical, mental and emotional, as well as ocular, and may have to be sent to the country, or to health resorts in the mountains or at the sea shore, it is generally sufficient to insist on a rational mode of life in the usual surroundings, with particular attention to good air, equable temperature, avoidance of overwork, moderate indulgence in athletics, hydrotherapy, frequent baths and sufficient restful sleep. These commonplace rules and regulations of life are accepted and approved, but rarely followed. Diet is of great importance, especially in children. Some infants are sensitized to mother's milk or the synthetic substitute with which they are being nourished. Weaning or a change of milk is often sufficient to clear up an obstinate blepharitis or eczema of the palpebrae in nurslings. In many families and some nurseries and infants' wards there are frequent attacks of enteritis. At times, overnourishment as to quantity and undernourishment as to quality are the results of giving eggs, cereals, meat, rich soups and similar foods. In older children, eating at any and all hours, irregularity of bowel movements, neglect of intestinal hygiene, hasty swallowing or bolting of food and insufficient mastication play a rôle, as indeed they may do in those old enough to use more discretion. Rich and fancy food, highly spiced dishes, sausage and forcemeats, salted meats and nuts, rich pastry and salad dressings and certain special foods, such as heavy fish, salmon and the like, asparagus, crabmeat, cabbage and strawberries, should be forbidden, and the use of heavy wines and strong liquor or cordials should be reduced to a minimum or stopped altogether, at least temporarily. Coffee, tea and tobacco may be allowed in moderation. The experienced clinician will know how to intensify or relax the dietary regimen and still bear in mind that one man's meat or drink may be another man's poison.

Local Treatment.—The removal of local irritants or factors of congestion of the palpebral margin and the prevention or avoidance of infection and secondary complications must be borne in mind. Certain procedures are commonly used in practically all forms of blepharitis. Lotions, washes, lid baths, compresses, camomile, fennel and other infusions or teas have been household remedies in diseases of the lid for many years, although the herbs generally in use may themselves cause irritation of the lids, particularly, if the lid bath is too concentrated or too hot. Even the popular boric acid solution may not be well borne. As to the temperature, "some like cold baths," but the wise practitioner may safely leave this to his patient. Washes may be used with boiled water or boric acid solution to which are added a few drops of alcohol, spirits of camphor, cologne water, tincture of iodine or a 4 per cent solution of subacetate of lead. Cuenod advises these drying or astringent solutions in cold or cool compresses applied for twenty minutes at a time. Boric acid, sodium biborate, or sodium bicarbonate (weak) solutions are generally grateful to inflamed lids, but even well diluted antiseptics such as a solution of formaldehyde, mercuric chloride, oxycyanide of mercury, phenol or hydrogen dioxide must be used with great caution and their effect carefully watched. My co-workers and I prefer luke warm compresses of infusions made with physiologic solution of sodium chloride or in simple cases bathing of the lids with sodium borate in an eye cup. When there is actual infection of the palpebral margin, we prefer permanganate, 1 : 4,000, oxycanide of mercury of like concentration or resorcinol, 1 : 250, as a wash, compress or bath. Besides having a chemical, medicinal action, these warm solutions cleanse the lids of matter, débris and crusts so thoroughly that mechanical measures are often superfluous. They must, of course, be used again and again. When watery solutions are not well borne or cause actual discomfort or increase of inflammation, the physician may have to have recourse to fats or oils, such as sterile petrolatum or oil of paraffin, olive oil, oil of sweet almonds or cod liver oil. Luke warm poultices of cornmeal or flaxseed are most acceptable when there is marked inflammatory reaction, and borosalicylated kaolin-glycerin will hold the heat even longer. Of course, for these applications a thin layer of gauze is interposed between the lids and the poultice.

Topics, Collyria and Salves: Strong chemicals, such as silver nitrate, 1 per cent, or even the solid stick (lapis mitigatus) sharpened to a point and applied with great delicacy and caution to minute obstinate ulcers of the palpebral margin are advised by Saint-Yves and others. Fage used trinitrophenol (picric acid) with good effect, and I can recommend an emulsion of colloidal spirits of turpentine, from 2 to 10 per cent, as suggested by L. Fenouil for a host of other local inflammations. Resorcinal, 1 per cent; zinc sulphate, 0.20 per cent;

copper sulphate, 0.20 per cent; sodium borate, 3 per cent and sulphonated bitumen, 0.20 per cent, may all be used as compresses. Many of these remedies, notably zinc and silver nitrate act well on a complicating conjunctivitis and are in general use, although the colloidal silver preparations, mild silver protein, strong silver protein and collargol are used more extensively at the present time. A. Darier advises scrubbing the palpebral margin with protargol on a fine brush or cotton applicator until a soapy lather is produced. When this is wiped away and the palpebral margin cleansed, another cotton pad soaked in zinc sulphate is prepared, and the margin again scrubbed. This is then wiped off after two or three minutes with a compress dipped in cyanide of mercury solution. The final step in all these procedûres is the protection of the palpebral margin by an oil or salve, such as borated petrolatum, White's ointment, zinc salve or an ointment containing sulphonated bitumen and zinc.

Massage and Digital Expression of the Glands and Follicles of the Palpebral Margin: These procedures supplement the mechanical removal of débris from the lashes and represent a sort of internal cleansing which is of practical use in almost all forms of blepharitis. The rubbing in of salve by the patient or well trained nurse has something of this effect in emptying the ducts of the glands and hair follicles, but something more is required in the way of an efficacious procedure. This consists in grasping the palpebral margin between the sterilized thumb and forefinger and exerting increasing pressure, as strong as needed, to squeeze out the contents of the glands along the palpebral margin. It has been suggested to carry out this procedure with the Knapp roller-forceps or with special forceps having hard rubber tips, but the digital expression is at the same time more powerful, more delicate, more easily regulated and more agreeable for the patient. Besides the beneficial effect of mechanical removal of effete matter and noxious products or germs, massage and expression facilitate the more thorough application of salves and topics and a deeper penetration into the infected structures of the chemicals contained. In spite of the most vigorous expression, however, one cannot hope to remove all the infectious matter from the hair follicle. The latter presents a natural plug or cork, namely the lash, itself, which decidedly obstructs the complete evacuation of the septic products of the follicle so that mechanical removal of the lashes is an important and necessary supplementary procedure in many cases.

Epilation of Lashes.—In many forms of inflammation of the palpebral margin, the lashes fall out of their own accord whether the follicles are primarily or secondarily affected. So it is best to "uncork" the follicle by pulling out the lash as soon as there is any definite indication of involvement of the hair follicle in the inflammatory or infec-

tious process. In practice, it is usually wise to epilate the adjacent lashes as well. While it will, of course, rarely be necessary to epilate the whole palpebral margin, it is just as well to be on the safe side, and prodigal in the application of this procedure, pulling out too many rather than too few hairs. In chronic obstinate blepharitis with persistent folliculitis, it is just as well to make tabula rasa and epilate the entire palpebral margin. This may even have to be repeated several times before a complete and final cure is obtained (Cuenod). In practice, the instillation of a drop of epinephrinized procaine hydrochloride suffices in most cases to render this procedure painless (? P. H. F.). After epilation, Cuenod carefully applies a solution of iodine in acetone to the palpebral margin. An occlusive dressing of glycerin is then put on the closed eyes and left in place for twenty-four hours. This method, used for many years, has given him excellent results and cure or marked improvement in almost every case.

Physiotherapy and Plastic Procedures.—Many physicial and mechanical agencies, such as heat, cold, hot air and steam, which tend to cause blepharitis, are also of use when appropriately applied and controlled in the treatment for this condition. Besides there are diathermy, ionization or iontophoresis, ultraviolet light, quartz and mercury vapor lamps, heliotherapy, x-rays, phototherapy, electrotherapy and even radium in its various forms or emanations. While of possible benefit as supplementary procedures, it is doubtful whether any of these measures are of great value by themselves. The loss of lashes was known to the ancients as madarosis (falling out) or, when associated with red palpebral margins, as milphosis, and when the margins were irregularly swollen, thickened or callous, as tylosis. From the earliest days various procedures have been employed to disguise the loss of lashes or actually to replace them. Cosmetics and colors were generally used for the purpose of masking the baldness or disfigurement of the palpebral margin, and even tatooing with india ink was used to imitate the line of lashes. Hirschberg (1888, 1892) attempted actual grafting of a piece of the brow into the palpebral margin and noted that Dzondi as far back as 1818 had tried to implant lashes in the bald palpebral margin. Knapp (1917) and Esser (1919) also made use of the eyebrow, and Lesser (1919) took a flap covered with fine hairs from the nape of the neck. In 1914, Krusius, following the suggestion of Schrieber, grafted into the empty eye lash follicles hairs, together with the sheath and follicle, which he had removed from the eyebrow, scalp, armpit and inguinal region by means of a grooved needle. No details of the technic or of the final results are given.

SPECIAL TREATMENT OF VARIOUS FORMS OF BLEPHARITIS

Blepharitis Eczematosa.—This condition generally follows or precedes simple blepharitis. Avoid all irritation of the skin, maceration,

rubbing of the lids, etc. Stop medication, particularly local instillations (atropine, eserine, cocaine) which may be causing reaction. For the itching and mild burning sensation, A. Darier recommends a salve of epinephrine with cocaine and a small amount of subnitrate of bismuth or one with 10 per cent sulphonated bitumen and zinc oxide. Mercurial ointments are useful but must be used with caution. Eyelid washes of mild silver protein, strong silver protein or zinc sulphate usually work beneficially. The least irritating preparations of mercury are the ammoniated mercury (1 to 5 per cent) and yellow mercuric oxides (2 to 3 per cent). In moist eczema inert powders or pastes made with water are preferable to greasy applications, as they favor desiccation and do not heat the skin. Secondary infections are best prevented by antiseptic lotions (resorcinol, turpentine). Lassar's paste works well, as does touching up the palpebral margin with 2 to 3 per cent solution of nitrate of silver. Itching and irritation are greatly relieved by moist applications of sulphonated bitumen water. In the earliest stages, a similar application of 90 per cent alcohol is advised by Tzanck as not painful and of great efficacy. In scaly eczema, all débris and crusts should be carefully removed by warm bathing, wet dressings and cold poultices of starch. The softened crusts are then washed away, and the gently dried lid anointed with sulphonated bitumen, glycerin, olive oil, cod liver oil, or yellow mercuric oxide salve with salicylic acid or resorcinol. Silver nitrate is contraindicated in infected eczema. In dry eczemas with prurigo, psoriasis or hyperkeratosis, the irritation is allayed, after cleansing, with epinephrine-cocaine in cold cream or Lassar's paste, to which from 0.25 to 1 per cent of tumenol has been added. Coal tar, washed, with sulphonated bitumen and zinc oxide in petrolatum (coal tar solution, N. F. ? P. H. F.) may also be used, and Terson advises salves of zinc peroxide, from 1 to 2 per cent. Subacute and chronic eczemas are obstinate and require the application of mercurial salves. Chronic scaly eczemas tend to disappear on application of tar pastes cautiously applied after milder drugs have been tried out (sulphonated bitumen, salicylic acid, resorcinol). Rarely does one have to use strong chemicals such as tar, sulphur, chrysarobin or pyrogallic acid or physiotherapy and various radiations.

Seborrhea and Oily Blepharitis.—Removal of débris should be followed by the application of white precipitate ointment, 5 per cent, and, above all, by sulphur (sublimatum, lotum or precipitatum) up to 10 per cent, alone or with sulphonated bitumen, 2 per cent (Cave). Mercurials are incompatible with sulphur, giving a black sulphur. They may be used alternately. Krückmann insists on the importance of weak solutions (0.33 per cent) of zinc sulphate and of bismuth salve 1 to 2 per cent, particularly when the tarsal conjunctiva is involved.

Massage and expression of the palpebral margin should be performed regularly and persistently.

Dry Seborrhea and Squamous, Scaly Blepharitis.—These forms are obstinate and last for years; they may improve at puberty, but generally persist for life. Treatment is largely symptomatic. For scaling and desquamation, salves of sulphonated bitumen, zinc, white precipitate, yellow oxide and other mercurials, are much used, as are preparations of various tar oils. In chronic cases, stronger applications, of silver nitrate, copper sulphate, chloral hydrate 5 per cent (Gradle), tincture of iodine, iodine-glycerin, trinitrophenol 1 per cent (Fage) localized to small points of the palpebral margin are useful. Finally, sulphur salve, for its disinfecting and keratolytic effect, may be used either alone or with zinc oxide,

Ciliary and Follicular Blepharitis.—In these cases rather vigorous treatment of the infection is required with solutions, salves, massage, expressions and epilation, and such antiseptics as tincture of iodine, pure or half and half with glycerin, in ether or chloroform, or acetone (Cuenod), glycerin trinitophenol (Fage) glycerin chloral (Gradle), a diluted solution of formaldehyde, U. S. P. (1:5), protargol, collargol, corrosive mercuric chloride from 1:30 (? P. H. F.) to 1:100 (Despagnot) (?P. H. F.). A. Darier recommends prolonged massage by the surgeon with mercurial or copper sulphate-sulphonated bitumen (2 per cent) salve. Patients or even trained nurses cannot be relied on for this purpose. They may rub in, at home, salves of sulphonated bitumen-zinc oxide, resorcinol or lipol (cholesterol-hydrous wool fat) and then apply an occlusive bandage for the night. Cuenod advises complete epilation followed by careful touching up of the lids with acetone-iodine, and then continuous glycerin poulticing for twenty-four hours. Marenholtz (1912) proposed a sort of local vaccination with a salve, prepared from an extract of cultures of (dead)) staphylococci, in a greasy excipient. This was rubbed into the palpebral margin repeatedly. A somewhat similar preparation of staphylococcus and streptococcus antivirus with an emulsion of staphylococcus, streptococcus and pyocyaneus in hydrous wool fat has been used in France for various skin diseases. These products, used alone, do not seem to have much value.

Ulcerative Blepharitis.—These are generally infected forms of follicular blepharitis requiring topical treatment in line with what has already been said. In addition cicatrization is stimulated by the use of salves containing thymol iodide, iodoform, iodized vaccines of Ranque and Senez, and lipovaccine of Le Moignic. My co-workers and I have used local injections of the last into the palpebral margin. There was little reaction. The therapeutic action, mildly favorable, may have been due in part to a systemic vaccination.

Impetiginous Blepharitis.—Not only the lids, but the face must be cleaned of impetigo vesicles and crusts by lavage, warm moist compresses, and lotions (boric acid, sodium bicarbonate, lime water). Salves of sulphonated bitumen with zinc oxide, ammoniated mercury, or Lassar's paste are much used, as are yellow mercuric oxide, resorcinol and salicylic acid, salves.

Sycosis, Acne and Furunculosis.—In these eruptions the suppurative element reaches its maximum of intensity and clinical and therapeutic importance. In addition to moist compresses, salves and expression and epilation, one must lance pustules, sties or small retention cysts. Sulphur and resorcinol are valuable as disinfectants after the minor surgical procedures mentioned. A. Darier recommends the old-fashioned turpeth mineral for acne rosacea, 13 per cent in hydrous wool fat and almond oil, to be rubbed in with massage for ten minutes every morning and night. At home, the patients with acne may apply lightly a solution of resorcinol and sulphur lotum in eau de Cologne to the affected spots, and daub them at night with glycerite of starch, or a salve containing small quantities of camphorated betanapthol, resorcinol, green soap, prepared chalk, and precipitated sulphur. In the morning, after washing, he should apply sodium borate in ether and rose water. In furunculosis, incision and drainage of the purulent accumulations or retentions are, of course, the first step.

Associated Blepharitis.—The special treatment for diseases of the palpebral margin in patients with disease of the adjacent mucous membranes is as interesting as that of the dermatitis forms. The improvement of the conjunctivitis generally goes hand in hand with that of the blepharitis. There is little to add to the routine treatment for the condition caused by the diplobacillus (Morax) or angular conjunctivitis by zinc, the general measures used in trachoma, Weeks' bacillus conjunctivitis, phlyctenular or lymphatic blepharoconjunctivitis. In dacryoblepharitis the appropriate mild treatment of the lacrimal and possibly nasal passages, repeated probing and injections of astringent and antiseptic solutions or operative procedure such as rhinostomy or extirpation of the sac is essential for a cure and in many cases for improvement. This applies also to disease of the nasal mucosa, turbinates and accessory sinuses, which should receive thorough examination and any required treatment. In acute coryza my co-workers and I prescribe inhalations of menthol, eucalyptol, menthol-cocaine-epinephrine salve (? P. H. F.), petrolatum or oil, or if these are irritating, a snuff containing bismuth, milk sugar and cocaine (? P. H. F.) or borax camphor and cocaine. In spasmodic rhinitis with frequent fits of sneezing, we find the eyes injected and the palpebral margins red and swollen with each acute attack. The hypersensitive nasal mucosa may require anesthetization with cocaine and epinephrine in oil, 3 per cent, and super-

ficial cauterization of the nasal mucous membrane is of value. Deeper cauterization or resection of the turbinate bodies is indicated in advanced disease with hypertrophic changes. Strumous (pseudo-atrophic) coryzas and simple atrophic rhinitis as well as ozena should be recognized and treated by the ophthalmologist. In children attacks of blepharitis often accompany adenoid vegetations. Removal of these growths and of hypertrophied tonsils, at a time where there is no local inflammation or "sore throat," is advisable.

GENERAL TREATMENT FOR BLEPHARITIS

General treatment for blepharitis is largely dependent on etiology as determined by heredity and the previous personal history. One may have to deal with diatheses like scrofula, lymphatism, anemia, chlorosis, gout, diabetes; disturbances of nutrition (deficiency diseases, avitaminoses), dyscrinisms or specific infections requiring treatment by the administration of antitoxins, immunization, vaccine therapy, arsphenamine, tuberculin, etc.

Lymphatism is a common accompaniment of blepharitis in young children. Cod liver oil has for a long time been the sovereign remedy on account of its nourishing content of lecithin and its tonic alkaloids. At times this remedy causes nausea, vomiting and diarrhea and must be replaced by iodotannic syrup, hydriodic acid, potassium arsenite (Fowler's solution) or solution of sodium arsenite (Pearson's solution), or cacodylate of soda, glycerophosphates of lime, sodium, potassium and iron. Hot saline baths followed by alcohol rubs, fresh air and sun baths, in the mountains or at the seashore are advised. In anemia and chlorosis we prescribe proto-iodide of iron, ferripotassium tartrate, nucleinate of iron (Dor) or injections of cacodylate. Arsenic has gone out of use somewhat, but is of value. Walks in the open air, preferably in the mountains, are essential. It may be possible to influence the local condition by a humoral (serologic) change brought about by methods of desensitization or passive immunization, as many cases of blepharitis indicate an unmistakable factor of anaphylaxis or allergy which must be considered as merely an increased or exaggerated degree of the normal defense mechanism of the organism. Injections of sodium chloride, hyposulphite, or carbonate, or treatment with small amounts of sensitizing foods or polyvalent peptone must be considered.

SUBSTITUTION TREATMENT FOR ORGANIC DEFICIENCIES

These deficiencies include not only lack of vitamins, antirachitic, antineuritic and antiscorbutic, but also lack of salines, carbohydrates or nitrogen elements, iron, or iodine. Osteomalacia, chlorosis, goiter, scrofula and many forms of ill defined but palpable undernourishment

and lack of stamina or resistance to infection or disease, are cases in point. Lack of the fat-soluble vitamin A is followed by conjunctivitis, edema of the lid and loss of lashes, and progresses to keratitis and xerophthalmia; the administration of this vitamin in the form of butter, cod liver oil and fresh fruit juices, is of great value in blepharitis. Dyscrinism requires careful determination of the actual balance in internal secretions, basal metabolism and special cardiovascular or psychoneurologic reactions, as well as the often extremely suggestive organic and physiognomonic peculiarities or functional, structural and emotional eccentricities of patients with hyperthyroidism and hypothyroidism and diseases of the suprarenal, gonadal or pituitary glands. Opotherapy in its various forms of substitution or adjuvant therapy, physiotherapy of all kinds, may be of particular value at certain developmental crises, such as puberty, the onset of menstruation and the climacteric in males as well as in females. The thyroid seems to have special action on the growth of hair. In exophthalmic goiter one notes almost invariably a loss of hair in the axilla, pubic region and palpebral margin (and brow P. H. F.), which is almost as characteristic as the triad: goiter, tachycardia, tremor (Sabouraud).

Antitoxic and Anti-infectious Treatment.—The use of polyvalent vaccines and other preparations of micro-organisms in the local treatment for purulent forms of blepharitis has already been mentioned. General immunization or desensitization may be effected or aided by eliminating toxins or products of fermentation or decomposition from the intestinal tract, or by neutralizing them by means of yeasts or antiferments. Fresh brewer's yeast is probably the most useful, as it is generally the most difficult to obtain when needed. Whether this agent and others, like koumiss, matzoon, lactic acid bacilli emulsions, etc., act by immunization, desensitization or modification of the intestinal flora, there is no doubt that they do help, particularly in the follicular forms with sycosis and furunculosis. Autohemotherapy has been found of great actual value (Tzanck, J. Darier) in giving relief from occupational eczemas of the lid, and autoserotherapy by gradually increased injections, after Flandin, is advised in the aforementioned cases as well as in blepharitis associated with manifestly anaphylactic reactions, such as asthma, hay-fever, urticaria and angioneurotic edema. Vaccination with stock or autogenous vaccines is in general use, particularly for the staphylococcus infections of the palpebral margin. In France their preparation has been perfected and somewhat complicated, so that there are special vaccines of many kinds. Another method of treatment is the destruction of bacteria in the organism by means of the therapeutic bacteriophage in obstinate cases of purulent blepharitis.

News and Notes

EDITED BY JOHN HERBERT WAITE

GENERAL NEWS

Report of Committee on Otosclerosis.—With respect to research in special fields of medicine, one may read with interest the April (1930) report submitted by the Committee on Otosclerosis of the American Otological Society:

"The committee early recognized that there was urgent need to collect, translate and codify the numerous contributions on otosclerosis which have been published in many languages by many workers. After considerable labor, it published a two-volume work of 684 pages (Otosclerosis, New York, 1929). In this there is present a summary of the investigations of otosclerosis to date. It makes readily available the results of many workers, and has already proved of value to those who desire to start along new paths. Here it is possible to familiarize one's self with the outcome of the studies of previous investigators. Even to those who are not carrying on investigation, it gives valuable information regarding the nature of the disease and lines of treatment which have been suggested, as well as other important points. This work has received highly commendatory press notices, both here and abroad.

"In outlining the research work to be done, the committee has been aided by neurologists, physiologists, anatomists and others in various universities in this country and in Canada. As a result of their advice, it was decided that since contributory causes resulting in progressive deafness were known with little or no certainty, it was advisable to study them intensively.

"One of these was the question of how far heredity is a factor, especially in otosclerosis. Prof. Charles B. Davenport of the Department of Genetics, Carnegie Institution of Washington, agreed to carry on this inquiry in connection with his department, which is eminently qualified for such an investigation. Sufficient funds were allocated to enable this to be done. In a preliminary report he states that the department has collected a 'wonderful lot of material covering 100 pedigrees of families, and has made a study of 340 individuals where otosclerosis shows a tendency to appear.' These studies confirm the idea that there is an inheritance of a factor or factors that make for otosclerosis. About 60 per cent of the children show otosclerotic tendency, but regarding the other 40 per cent the inheritance is not clear. The tentative suggestion is made by the writers 'that there are other causes which play an effective part, and further research is being done to determine what these causes may be.' We need not point out that this raises an important question. To aid further research, additional funds have been allocated.

"It has been believed, with a considerable amount of probability, that a disturbance of metabolism will produce or aggravate otosclerosis. With this in view, under the supervision of Profs. James B. Collip, Boris P. Babkin and Herbert S. Birkett, a study is being made at

McGill University of the effects of the glands of internal secretion on the ear and on hearing. It is well known that these glands play an important part in the ultimate changes in our bodies. This very difficult investigation is still in its experimental stage and it is not possible at this time to give even a preliminary report.

"From Harvard Medical School, Prof. Eugene A. Crockett reports on the effects of particular diets with measured calcium contents when given young people from otosclerotic families who are beginning to show early stages of this disease. During the period in which the study was carried on, improvement was noted. This work is being continued, as the period is yet too brief in which to give a definite statement or outline of the permanent efficiency of the above treatment.

"Work has been done by Prof. Theodore H. Bast of the University of Wisconsin regarding the method in which the normal bone is formed in the ear in fetal and infantile life. Here our knowledge has been very defective. Dr. Bast has found that in the ear the bone is formed in a manner somewhat different from that in which other bones of the body are formed and that there is normally present a residue of what may be called imperfectly ossified areas which persist during the life of the individual. It is noteworthy that it is in one of these areas that otosclerosis most commonly appears, and to which it may be confined. Dr. Bast has finished the work in the embryo and is now carrying this investigation into early infantile life.

"It was obvious to the committee that the time was not far off when experimental work would have to be done on animals, by feeding, by administration of drugs, or otherwise, in order that the hearing of animals so treated might be accurately ascertained. At present no good method of testing hearing in animals is available, and the committee felt that, as a necessary preliminary to this investigation, a new and definite method should be sought. After careful consideration and correspondence with several leading physiologists and psychologists, it was decided to allocate funds for two fellowships which will be offered to suitable candidates to work at McGill and Cornell universities, where there are laboratories well equipped for this work and professors interested in such an investigation.

"It will be noted that the investigations being done are conducted in various universities. The committee has endeavored to stimulate the work in scientific departments where it can best be carried on. The aim has been to secure the best men who were available and free, no matter where, and assist them in every way. In order to obtain full information with regard to all available possibilities throughout the country, a scientific advisory committee has been appointed, and it is expected that its assistance will greatly facilitate the work of the central body."

Sight-Saving Classes for Children.—In ninety-five cities of twenty-one states there are now 350 sight-saving classes for the education of children with seriously defective vision. Here an effort is made to conserve the sight which remains, and to give these children the same sort of education that is given to children with full vision. To train teachers for the special methods used in sight-saving classes, courses are being planned this summer at Columbia University, the

University of Chicago, the University of Cincinnati and the State Teacher's College in Buffalo.

Ocular Hemorrhage from Scurvy.—Oculists who have observed hemorrhages in the eye and adnexa from scurvy will be interested in the results of experiments recently carried out at the Mellon Institute of Industrial Research at Pittsburgh. Winter milk from ensilage-fed cows is as rich in the antiscorbutic vitamin C as the best summer milk from cows on pasturage. Light boiling of the milk for five minutes in vessels of glass, as compared with similar treatment in vessels of aluminum, showed slight destruction of vitamin C in each case, equal in amount.

UNIVERSITY NEWS

The second annual postgraduate course in ophthalmology was given at the University of Iowa from April 28 to May 10, 1930, inclusive. The course was limited to ten students, and the following guest instructors were in attendance: Dr. Edward Jackson, Dr. William L. Benedict, Dr. Harry Gradle and Dr. Lawrence T. Post. Courses were offered in optics, refraction, muscle anomalies, bacteriology, pathology, slit-lamp microscopy, surgery, perimetry and diagnosis of lesions of the fundus.

On Thursday, May 8, at the Massachusetts Eye and Ear Infirmary, Dr. Laurance D. Redway, of New York, demonstrated to a group of ophthalmologists, neurologists and internists the results which he is obtaining in instantaneous color photography of the human eye. Reproduction in color of the details of conjunctiva, cornea, iris and lens affords a considerable advance for recording the progress of the interesting case, and offers much interest to ophthalmic teaching. It is to be hoped that ophthalmic teaching centers will begin to utilize Dr. Redway's pioneer work.

The first annual graduate course in ophthalmology will be conducted from August 4 to August 8 at Rochester, N. Y., under the auspices of the University of Rochester. Attendance will be limited to thirty members, and instruction will be given in the various practical subdivisions of ophthalmology, by resident and guest faculty. The guest lecturers for the course include Drs. Walter Parker, Detroit; Arthur J. Bedell, Albany; Conrad Berens, New York; W. I. Lillie, Rochester, Minn.; P. C. Kronfeld, Chicago, and Jonas S. Friedenwald, Baltimore. Dr. John F. Gipner is director of the course.

SOCIETY NEWS

British Medical Society.—The Canadian branch of the British Medical Society, meeting at Winnipeg on August 26, offers the following interesting program through its section of ophthalmology. First day: "The Control of Trachoma"; to be opened by N. Bishop Harman (London), followed by S. Hanford McKee (Montreal). Second day: "The Management and Treatment of Incipient Cataract"; to be opened by L. Vernon Cargill (London), followed by T. Herbert Bell (Winnipeg), and A. W. Ormond (London). Papers: "Color Vision," by Frank Allen (Winnipeg), and "The Subconjunctival Extraction of Cataract," by Norman B. B. Fleming (London).

German Ophthalmological Society.—The society will hold its meeting in Heidelberg on June 12, 13 and 14. The following papers will be read:

1. Amsler (Lausanne): Photo-Keratoscopy.
2. Ascher (Prague): Experimental Analysis of Miotic Drugs.
3. Baurmann (Göttingen): Clinical Observations in Two Cases of Pulsating Exophthalmos.
4. Best (Dresden): Decussation of Motor and Sensory Pathways and Cajal's Theory.
5. Blaickner (Salzburg): Iridencleisis Operation. Treatment of Serpent Ulcers. Diagnosis and Treatment of Lens Abscess.
6. Brückner (Basel): Regeneration of the Vitreous.
7. Bücklers (Berlin): Spectrographic Study of Absorption of Light by the Human Lens.
8. Comberg (Berlin): A Factor of Convergence and Convergent Squint.
9. Elkes (Frankfurt-on-Main): Experimental Study of the Source of Diphtheria Infection in Eyes, and the Influence of Antitoxin.
10. Engelking (Freiburg): Individual Differences in Color Sense.
11. Erggelet (Jena): Radiant Energy on the Eye.
12. Fischer (Leipzig): An Experiment to Determine the Energy Exchange within the Eye.
13. Gilbert (Hamburg): Uvea and Endocrine Disturbances.
14. Grüter (Marburg): Etiology of Disciform Keratitis.
15. Hartinger (Jena): The Correction of Poor Sight by Means of the Polished Zeiss Contact Glass.
16. Hertel (Leipzig): Further Studies of the Microscopic Structure of the Eye Tissues.
17. Von Hofe (Leipzig): Examination of Sight in Cases of Squint Amblyopia.
18. Hoffmann (Königsberger): Retinal Changes after X-Ray Therapy.
19. Jaensch (Breslau): Fat Degeneration of the Retina in Endophthalmia and Sympathetic Ophthalmia.
20. Imre, Jr. (Budapest): Therapeutic Study and Result with Amyl Nitrate in Fundus Diseases.
21. Kubik (Prague): Pathology of the Human Cataract.
22. Kyrieleis (Würzburg): The Effect of Strychnine on the Eye Reflexes.
23. Lenz (Breslau): Examination of the Inner Organization of the Visual Cortex.
24. Lindner (Vienna): My Present Technic in Gonin's Operation.
25. Loeffler (Ried): Atmospheric Changes as Exciting Causes of Acute Glaucoma.
26. Löhlein (Jena): Pressure Curves in Glaucomatous Eyes.
27. Marchesani (München): Histologic Examination of Retinal Glioma.
28. Meesmann(Berlin): Blood Gas Analysis in Rabbit Eyes.
29. Meisner (Greifswald): Chronic Myositis of External Ocular Muscles.
30. Müller (Basel): Measurement of Intra-Ocular Pressure.
31. Mylius (Hamburg): Agglutinins in the Aqueous.

32. Passow (München): Importance of Lipoids in Primary Glaucoma.

33. Pflimlin (Basel): Clinical Differentiation of Different Forms of Herpes Corneae.

34. Poos (Münster): Morphologic Changes with Pharmacologic Effect on the Eyes.

35. Reitsch (Hirschberg): Shrinking of the Conjunctiva in Palpebral Fissure.

36. Riehm (Würzburg): Anaphylaxis.

37. Rohrschneider (Berlin): Experimental Cataract after Repeated Radiation with Small Doses of X-Ray.

38. Scheerer (Tübingen): Different Forms of Optic Nerve Entrances in High Grade Myopia.

39. Schmelzer (Erlangen): Observations of the Iris Vessels of the Human Eye.

40. Sondermann (Berlin): Contribution to Question of Resorption from the Anterior Chamber.

41. Von Szily (Münster): Capillary Endothelium.

42. Thiel (Berlin): Glaucoma without High Pressure.

43. Thies (Dessau): Endocrine Eye Diseases.

44. Thorner (Berlin): Apparatus for Stereoscopic Ophthalmoscopy in Red-Free, Focal and Diffuse Light.

45. Tschermak (Seysenegg-Prag): What Is Neutral Light?

46. Velhagen, Jr. (Halle): Examination of the Aqueous.

47. Vogelsang (Bonn): Ballistic Elastometry and the Eye.

48. Wegner (Greifswald): Study of the Relationship Between Water-Content and Glaucoma.

49. Werdenberg (Davos): Typical and Atypical Course of Eye Tuberculosis.

In addition to the foregoing papers, twenty-six interesting demonstrations are scheduled.

Abstracts from Current Literature

EDITED BY DR. WILLIAM ZENTMAYER

Anatomy and Embryology

THE ZONULA OF ZINN. EMBRYOLOGY—ANATOMY—PHYSIOLOGY. G. LODDONI, Ann. di ottal. e clin. ocul. **57:** 773 (Oct.-Dec.) 1929.

The author examined the eyes of fetuses from 3 to 9 months of age with the slit-lamp and compared his observations with those made on the adult eye. At 3 months, no trace of zonular fibers can be made out. At 4 months, a number of granules appear between the ciliary processes and the lens-equator, marking the surface between the early vascular vitreous and the final vitreous. They are apparently derived from the vitreous, and by the sixth month a definite membrane has developed from this tissue connecting the ciliary processes with the lens, in which anterior, equatorial and posterior fibers can be made out. Circular fibers in this membrane unite the ciliary processes with each other. The fibers are apparently condensations of a cement substance which unites the ciliary processes to the lens. By the eighth month the posterior surface of this substance with its fibrils is differentiated to a definite membrane. By the ninth month the zonula is almost the same as in the fully developed eye. In the adult eye a definite circular network of fibers fills the depressions between the ciliary processes, and the radial fibers attach to this network, which extends back almost to the ora serrata. The attachment of the radial fibers to the lens pulls its capsule into a series of undulations. These are much less marked when the lens is removed from the eye in its capsule. The fibers attaching to the posterior surface of the lens are longer and more delicate than the equatorial fibers and, running at various angles, fill up most of the so-called space of Petit. The fibers inserting on the anterior surface are quite thick and branch to finer fibrils as they approach the most anterior ciliary processes, on either side of which the branches attach. They are connected by a homogeneous transparent membrane which reflects the light of the slit-lamp uniformly and is slightly concave anteriorly.

The author discusses the various theories of accommodation in their relation to the structure of the zonula. He believes that the elaborate attachments of the fibers on the surfaces as well as at the equator of the lens afford some evidence in favor of this Tscherning theory by which during accommodation an active pull on the lens surfaces increases its curvature. The fact that he saw no relaxation in the zonula fibers when he compressed the sclera at the equator is also against the currently accepted theory of Helmholtz.

S. R. GIFFORD.

THE ANATOMY OF THE VITREOUS. KARL HEESCH, Arch. f. Augenh. **100-101:** 680, 1929.

The vitreous is a transparent colorless body filling the largest part of the eyeball. Its anterior surface forms a groove, the fossa patellaris,

in which the lens rests. The whole posterior portion from the optic disk to the ora serrata is covered by a thin membrane, the membrana hyaloidea. Anteriorly this continues as the inner layer of the ciliary body and the iris. This layer forms the membrana terminalis which joins the posterior capsule of the lens. Around the fossa patellaris there is a fine band which goes forward to attach on the posterior surface of the lens, called the ligamentum hyaloidocapsulare. The posterior limiting membrane of the vitreous, the membrana hyaloidea, is not present over the optic disk. Here it runs forward forming the walls of the canal of Cloquet. Most authors assume that the membrana hyaloidea and the internal limiting membrane of the retina are one and the same structure. Vitreous is only tightly adherent at one point. This is a ring-shaped surface running forward about 1.5 mm. from the ora serrata and spoken of as the vitreous base. The normal histology of the vitreous depends largely on the type of fixation and the staining methods employed.

Most authors regard the vitreous as arising from ectoderm, but they also hold that the mesoderm is associated in its structure. In all animals that possess a vascular system in the embryonal eye both layers go to form the vitreous. The vitreous threads seem to come from the retinal cells, the cells of the lens and those cells which are around the vessels. Von Szily regards the whole vitreous as arising from ectodermal cells in which mesodermal cells secondarily come in.

According to Koeppe, the structure of the vitreous is as follows: In its anterior half the vitreous shows a concentric lamellar structure formed by two kinds of fibers running nearly at right angles to one another. The vitreous is, therefore, formed by an extremely fine grating of fibers.

The author describes the methods of ultramicroscopy and shows that the normal vitreous is composed of ultramicroscopic threads forming a felt work. This is quite compact in the periphery of the vitreous, especially in the anterior layers. Toward the center of the vitreous this felt work becomes less dense, and the fibers composing it are longer. The threads average about 9.8 microns.

There follows a discussion of the significance of the ultramicroscopic observations and their relationship to the structures observed with the slit-lamp.

F. H. Adler.

Anatomic and Clinical Observations on the Zonular Lamella and its Detachment from the Lens. A. Busacca, Klin. Monatsbl. f. Augenh. **83**: 737 (Dec.), 1929.

The author reviews the recent literature on the anatomy of the lens capsule. He distinguishes three layers of the equatorial and perieequatorial portion of the lens: the zonular lamella, which consists of fibers of the zonula; the pericapsular membrane, which is a very thin film covering the entire capsule of the lens, and the capsule of the lens itself. The fibers forming the zonular lamella spring from the pericapsular membrane. Some of its fibers, having penetrated the pericapsular sac, enter the capsule of the lens.

In four clinical cases of detachment of the zonular lamella from the lens, reported by the author, the zonular lamella was detached from the

pericapsular membrane which remained adherent to the capsule of the lens. This detachment is probably the result of a degenerative process at the termination of the zonula fibers and can be found in cases of spontaneous luxation of the lens. Trauma may lead to a detachment of the pericapsular membrane from the lens and zonular lamella. So-called detachments of the zonular lamella, observed by some authors in the anterior surface of the lens and visible within the pupillary area, are, in Busacca's opinion, either deposits on the anterior capsule, or ruptures and stretchings of the pericapsular membrane or of the superficial layers of the capsule itself.

K. L. STOLL.

Physiology

THE INTRA-OCULAR TENSION OF THE NORMAL EYE IN ACCOMMODATION AND CONVERGENCE. G. TESSIER, Ann. di ottal. e clin. ocul. **57:** 799 (Oct.-Dec.) 1929.

The author describes the work of Salviati, who found an increase of tension during accommodation and convergence greater in the glaucomatous than in the normal eye, and greater when recorded on the sclera with Bailliart's tonometer than when taken on the cornea. He reports an attempt to repeat his work on a larger number of patients, with more exact control of conditions than was maintained by the previous author. In twenty-nine normal persons tension was taken on the cornea and sclera with the Bailliart tonometer, the patients being in the sitting posture. This was repeated when the patient was fixing a near object. While there were variations of a few millimeters in some cases, a slight reduction was observed as often as an increase, and in general there was no change in tension. Ten cases of hyperopia and ten of myopia were then tested in the same way, with the same results. Twelve cases under atropine mydriasis, in which the effect of convergence without accommodation could be studied, showed no change in tension. In cases with strabismus, the accommodation alone could be studied, and in these cases also there was no change in tension. Tension taken on the sclera was always a few millimeters higher than that taken on the cornea. The author concludes that the effect of accommodation and convergence on tension is negligible and hence could have no tendency to produce myopia, as Levinson has claimed.

S. R. GIFFORD.

THE ACTION OF STRYCHNINE ON THE NORMAL PUPIL AND IN CASES OF PUPILLOTONIA. W. KYRIELEIS, Arch. f. Ophth. **123:** 1 (Oct.) 1929.

After subcutaneous injection of 1 mg. of strychnine nitrite the reaction of the normal pupil to light was studied. The course of the reaction under strychnine resembled the sphygmogram in cases of insufficiency of the aortic valves (water-hammer pulse). The onset of the contraction was more rapid, the contraction itself was carried out with much more force, and the pupil usually contracted to a smaller diameter than without strychnine.

The action of strychnine was then studied in cases of pupillotonia. This pupillary anomaly is characterized by the following symptoms:

The pupil is relatively wide, does not react to the ordinary light stimuli, responds very slowly to accommodation, remains in the contracted state longer than the accommodation muscle does (Saenger's type) or returns to the original width with the relaxation of the accommodation (Strasburger's type). Kyrieleis observed six cases of this rare anomaly. There were no signs of syphilis in any of his cases nor any symptoms of an organic nervous disease. Some symptoms indicated the presence of a neuropathic constitution. Under the influence of strychnine the light reflex, which was almost absent before, became more marked, especially if the pupil was stimulated repeatedly with short intervals between the single stimulations. With this method the reaction to light could be brought to normal. These observations speak in favor of Behr's theory that a functional weakness of the nucleus of the third nerve is the cause of pupillotonia. Furthermore, they indicate that the cells that are located around the pupillary nucleus and that transfer the stimuli from the afferent fibers to the cells of the nucleus (Schaltzellensystem) are affected in pupillotonia.

P. KRONFELD.

Physiologic Optics

SOME PHYSICOCHEMICAL FACTORS INFLUENCING THE INTRA-OCULAR PRESSURE. EXPERIMENTS ON THE PERFUSED EYE. W. S. DUKE-ELDER and P. M. DUKE-ELDER, Brit. J. Ophth. **13**: 385 (Aug.) 1929.

In a former paper it was shown that variations in the intra-ocular pressure could be brought about in various ways, one of which was "disturbance of the physicochemical equilibrium in the plasma or in the ocular media."

In this paper these disturbances are dealt with so far as they fall within the three following groups: (1) changes in the osmotic concentration of the crystalloids of the plasma; (2) changes in the osmotic concentration of the colloids of the plasma, and (3) changes in the volume of the vitreous and lens so far as they are influenced by the hydrogen ion concentration of the plasma.

The experiments were conducted on dogs. The apparatus employed was modeled on the perfusion pump of Dale and Schuster.

The authors detail the technic employed and describe the series of experiments conducted, from which they draw the following conclusions:

1. The intra-ocular pressure falls with an increase in the osmotic concentration of the crystalloids in the blood, and rises with a decrease in their concentration.

2. The intra-ocular pressure falls with an increase in the osmotic concentration of the colloids in the blood, and rises with a relative decrease in their concentration.

3. Within the limits of the changes in the reaction of the blood which was used in these experiments the intra-ocular pressure falls with a decrease in p_H and rises with an increase of p_H.

W. ZENTMAYER.

Experimental Pathology

THE NATURE OF THE OCULAR LESIONS PRODUCED EXPERIMENTALLY BY NAPHTHALENE. D. R. ADAMS, Brit. J. Ophth. **14:** 49 (Feb.) 1930.

After a review of the literature the author described the technic employed in her experimental work. It was found that the variation in time of the appearance of, and rate of development of, the intraocular lesions was due chiefly to the size of the dose used, especially the initial dose, and to the age and size of the rabbits. These factors were then standardized. It seemed an invariable rule for the retinal exudates to appear just before the onset of the changes in the lens. On the other hand, the lens often remained in the stage of early striae, although the retina had become completely atrophic and detached. This would suggest that the nutrition is independent of that of the retina.

The retinal lesions consist of small white spots at the extreme periphery of the fundus. They increase in size and number and spread in toward the optic disk. In the early stage the globules reflect bright points of light; later they coalesce to form fluid exudates often so transparent that the choroidal vessels can be seen through them. In some animals the initial stage was absent, there being a marked edema of the retina associated with edema of the conjunctiva. In the early stage of retinal changes microscopic examination of the eye showed a swollen lens with a few peripheral striae or vacuoles. The vitreous gel was less firm than usual. The retinal lesions were localized patches of edema. No other changes were found in other tissues of the eye save for a slight hyperemia of the ciliary body and choroid and a few leukocytes deposited on the back of the cornea. Atrophy of the retina rapidly follows the edema. The appearance is one of marked degeneration. The choroid also becomes degenerated and heavily pigmented.

The changes in the lens were found to agree with those described by previous observers. The crystals are like synchisis scintillans. They are in the posterior part of the vitreous and on the surface of the retina. They are double refractile, colorless, four-sided plates of irregular shape which occur in rosets or overlap one another in groups. They are inorganic and from their behavior with reagents are undoubtedly calcium oxalate.

Certain features suggest that the action of naphthalene may be due to a disturbance in the normal balance of the inorganic constituents in the body, rather than to any direct toxic effect.

W. ZENTMAYER.

EXPERIMENTS ON PIGMENT WANDERING IN THE EPITHELIAL LAYERS OF THE CORNEA. W. LÖHLEIN, Arch. f. Augenh. **100-101:** 385, 1929; **102:** 497, 1930.

The author produced abrasions of the epithelium in rabbits' corneas, and followed the development of pigment during the regeneration of the epithelium. It was possible by this means to follow exactly the regeneration of the epithelium. After a complete removal of the epithelium

there is a concentric wandering of all the epithelium in from the limbus, which is completed in five or six days. This covering is extremely thin in the lower quadrants and is unpigmented. In the upper two-thirds, however, it is much thicker and the majority of cells contain pigment. Two different forces effect this epithelization: (1) the tendency of epithelium to cover surfaces; from all parts of the limbus the superficial epithelial cells with equal rapidity push forward over the cornea; (2) the mechanical forces concerned with closure of the lids; this is most marked in the case of the upper lid and of the nictitating membrane.

This has the effect of moving more epithelial cells down from above and from the nasal side. These cells are for the most part pigmented. After six days the epithelium acquires its normal thickness. Because of various mechanical influences, the cells in the middle third of the cornea become heaped up. This may lead to the well known clinical picture of recurring erosion of the cornea. In the course of two or three weeks the pigment is gradually lost.

F. H. ADLER.

XANTHOMATOSIS BULBI (VON SZILY) AFTER HEMORRHAGE IN THE ANTERIOR CHAMBER. K. SAFAR, Arch. f. Ophth. **123**: 19 (Oct.) 1929.

Safar observed a case of perforating injury in which a massive hemorrhage in the anterior chamber was transformed into an orange-yellow mass within about five months. Shortly after the injury it looked as though the eyeball would shrink. With the formation of the yellow mass, however, the eyeball regained its normal shape and the tension increased. There were two possibilities of explaining the formation of the yellow mass. It might have been that the blood, because of the inability of the iris to absorb it, was split into its constituents so that the fatty substances of the red corpuscles formed the orange mass. The other possibility was that the necrotic iris was transformed into granulation tissue which finally underwent fatty infiltration from the blood stream.

In order to decide which of these two processes actually took place, the author performed the following experiment on a rabbit. Through a keratone incision the iris and the lens were completely removed. The operation was followed by a severe intra-ocular hemorrhage which within four weeks was transformed into a yellow mass. The histologic observations in this eye were: Granulation tissue that took its origin from the ciliary body was filling the space between the hemorrhage and the cornea; lipoid substances were found in the cells of the granulation tissue and extracellularly in the peripheral parts of the granulation tissue; the fat was anisotropic. The cells around the hemorrhage gave a strong iron reaction (Berlin blue reaction). The author therefore concluded that in these cases of severe injuries with hemorrhages in the anterior chamber the granulation tissue that is formed by the iris or the ciliary body stores the fatty substances of the blood corpuscles which are decomposed in the eye.

P. KRONFELD.

THE PATHOGENESIS OF CHOKED DISK. G. LEVINSOHN, Arch. f. Ophth. **123:** 34 (Oct.) 1929.

In 1906, Levinsohn put forth the following theory concerning the pathogenesis of choked disk:

1. Choked disk is not caused by inflammation nor by transportation of cerebrospinal fluid into the anterior part of the optic nerve. There is, instead, a choking of the normal exit of fluid from the anterior part of the optic nerve. 2. It is entirely a mechanical process. 3. The pathologic process lies in the lymph spaces around the central vessels as they take their oblique course through the vaginal space.

This theory was based on anatomic, experimental and clinical studies which had revealed the following facts: 1. In the vaginal space of the optic nerve there is only a slow movement of fluid. 2. There is a slight stream of cerebrospinal fluid from the brain through the vaginal space, and from the eye along the axial strand (lymph vessels around the central vessels). Both spaces have their exit from the optic nerve through the perivascular lymph spaces of the central vessels. 3. Beginning inflammation of the anterior part of the optic nerve (which causes obliteration of the vaginal space) is very different from that of beginning choked disk which is a hydrops.

The author compares his theory with those of Schieck, Parinaud and Behr. He lays stress on the point that the cerebrospinal fluid in hydrocephalus and in increased brain pressure is of a pathologic nature which leads to a swelling of the cells of the lymph vessels in their oblique course through the vaginal space and a consequent interference with their function. Schieck modified Levinsohn's theory, assuming that the cerebrospinal fluid under high pressure actually enters the perivascular lymph spaces. In his opinion it is cerebrospinal fluid which chokes the disk while according to Levinsohn's theory it is only the stagnant lymph fluid of the eye and of the anterior segment of the optic nerve. In dead eyes, however, Schieck was able to force fluid from the vaginal spaces back into the bloodless and fluidless optic nerve. These injections failed in live animals. In Behr's theory the point of closure which causes the choking is the canalis opticus. This author also assumes a considerable amount of lymph stream in the optic nerve itself which mainly follows the glia fibers. According to Behr, this system of lymph spaces communicates with the perivascular system, so that Behr's and Levinsohn's theories are not dissimilar.

Compression of the central vein, which seems to be quite common in choked disk, does not cause the choking as Deyl thought, but it explains the retinal hemorrhages that are so frequent in choked disk.

P. KRONFELD.

Lids

THE TREATMENT OF ENTROPION BY DE WECKER'S METHOD. POPOVICI, Cluj. med., 1929, no. 9.

This method consists in alcoholization of the nerve endings of the facial nerve. The author used this mode of treatment in spastic entropion of the upper and lower eyelids and in entropion of trachoma with trichiasis and distichiasis. He has seen good results, especially in trachoma.

N. BLATT.

Conjunctiva

TRACHOMA IN ITALY. L. MAGGIORE, Ann. di ottal. e clin. ocul. **57**: 763 (Oct.-Dec.) 1929.

The incidence of trachoma varies greatly in different parts of Italy. In Sardinia, 76 per cent of the dispensary patients have trachoma, while in Lombardy and Tuscany the figure is only 8 per cent. The author estimates that 13 per cent of the population of Sardinia and 5 per cent of Sicilians are trachomatous while in the rest of Italy only from 1 to 0.02 per cent are affected. In Brindisi, 96 per cent of the patients in eye clinics have trachoma. Similar figures are shown by school statistics. On the basis of such figures, it is estimated that there are about 80,000 trachomatous persons in Italy. During the past twenty years, a definite decrease in trachoma in nearly all parts of Italy was established. The incidence of severe complications of trachoma was found to be greatest in regions in which the disease was most frequent. Measures taken against the disease are described, including compulsory notification of cases to the health department, examination of the eyes of all school children in infected districts and segregation of trachomatous children. In larger cities this is done in special schools; in other places the cases are segregated in the school. Rome, Milan and Naples provide for treatment in the schools. Two hundred and fifty-three free clinics in Italy care for other cases. Education in hygiene and prophylaxis is being widely carried out. The author's conclusion is worth quoting, "It is a cruel struggle, which will require millions and years; but the Italians have absolute faith in the executive genius of their Duce and are certain that the problem of trachoma, like others of great importance, will be fascistically confronted and happily resolved."

S. R. GIFFORD.

EARLY PLASTICS IN CASES OF BURNS OF THE CONJUNCTIVA. O. THIES, Arch. f. Ophth. **123**: 165 (Oct.) 1929.

The author reports cases on which he did transplantations of mucous membrane from the lips (Denig's operation) in early stages of burns of the conjunctiva (between the fourth and tenth day after the injury). The operation should be done only (1) if the necrotic part of the conjunctiva is well demarcated from the healthy tissue and (2) if the underlying sclera is normal. If the sclera is necrotic, the transplantation fails. Anesthesia of the cornea is always an argument in favor of doing the transplantation.

P. KRONFELD.

Cornea and Sclera

DENDRITIC KERATITIS FOLLOWING THERAPEUTIC INOCULATION OF MALARIA. W. C. FINNOFF, Am. J. Ophth. **12**: 978 (Dec.) 1929.

The author gives a short résumé of the literature on the relation of dendritic keratitis to malaria. He reports two cases. In case 1, malarial treatment was instituted for neurosyphilis. After the fourth rise in temperature the left eye became red, and the next day presented a typical herpetic infiltrate. There was an associated nasal herpes. In case 2, pain was noticed in the left eye twenty-one days after malarial inocula-

tion, and two days after the malarial fever had terminated spontaneously. Three days later, a typical dendritic keratitis was seen.

W. S. REESE.

HYPOPYON ULCER OF THE CORNEA DUE TO GLENOSPORA GRAPHII. R. E. WRIGHT, Brit. J. Ophth. **13:** 496 (Oct.) 1929.

The patient, a woman, aged 38 years, had injured the eye six weeks before by a piece of stubble (rice or possibly other stalk).

The corneal ulcer was situated in the center of the lower quadrant. It differed from the ordinary hypopyon ulcer by appearing more indolent. It presented an undermined edge, a gutter of demarcation and a grayish-yellow and tightly adherent central mass. The detached slough showed, under the microscope, an indistinct mycelium.

The bacteriologic report made by Lieutenant-Colonel Acton was that the fungus belongs to *Aleuriosporinae* of the genus *Glenospora*. The treatment consisted in the use of atropine, the application of iodine, the internal administration of potassium iodide and the intravenous use of iodine. Healing was slow.

W. ZENTMAYER.

A COMPARISON OF THE METHODS OF MEASUREMENT OF CORNEAL CURVATURE WITH THE OPHTHALMOMETER AND PHOTOGRAPHY. F. BERG, Acta ophth. **7:** 386, 1929.

Two methods for measuring the corneal curvature are described. The results are plotted and compared. From the comparison of the results obtained, Berg notes that with the ophthalmometer there is an error of dispersion of about +0.15 diopters in the center of the cornea, whereas with the photographic method it is about +0.2. At the periphery of the cornea the ophthalmometer error is greater than the photographic. When the error of refraction is small, this method is quite accurate and when it is great, both are inaccurate. In view of the similar results with both procedures, Berg prefers the ophthalmometer because it is less time-consuming and intricate.

A. M. YUDKIN.

Vitreous

LOSS OF PERIPHERAL VISION AFTER HEAD TRAUMA. C. J. MCCULLOUGH and W. J. L. MCCULLOUGH, Am. J. Ophth. **12:** 741 (Sept.) 1929.

A white man, aged 58, received an injury to the head in June, 1928. The patient was dizzy and sat down for ten or fifteen minutes but completed his day's work two or three hours later. There was some vertigo and headache for five days when the headache became more severe and complete blindness appeared accompanied by confusion, difficulty in speech and vomiting. There was no unconsciousness, convulsions or paralysis. The blindness and confusion lasted for about ten days and were followed by some improvement. Examination showed vision of 5/200 in each eye, slight speech defect, moderate deafness, blood pressure of 200 systolic and 110 diastolic, slight cardiac enlargement, diseased tonsils and several carious teeth. Alexia could not be determined as the

patient could not read. The eyes showed no abnormalities except marked contraction of the fields not of the tubular variety. Examination of the ear showed loss of tones above 2,048 double variations in either ear and dulness and moderate retraction of both tympanic membranes. Settlement was advised on the basis of complete loss of industrial vision.

W. S. Reese.

Uvea

The Ophthalmoscopic Picture of Naevus (Melanoma) Choroideae. K. B. Johnston, Brit. J. Ophth. **13**: 498 (Oct.) 1929.

The cases here reported were from the clinic of Meller in Vienna.

In the first case the nevus was on the outer side of the macular region. It was a slightly elevated, slate-gray, round plaque, with an indistinctly defined margin. It was a little larger than the disk. The fundus was brownish red. The pigment obscured all underlying choroidal details.

In the second case the nevus was situated above the macula; it was slightly elevated and disk shaped. Its size and color were similar to those in the first case. The outline was definite. The fundus was tessellated. The epithelium was poorly pigmented.

In the third case the nevus was in the periphery of the fundus. In size, shape, color and outline it resembled that in the second case. The nevus was crossed by both retinal and choroidal vessels. The fundus was albinotic. It demonstrated clinically that the nevus was in the outer layer of the choroid, as vessels of the medium-sized layer were seen crossing it. In none of the cases were there degrees of proliferation or change in the overlying pigment epithelium. The following conclusions are drawn:

1. The color of a true nevus clinically is always a uniform slate gray.

2. The outline varies from being feathery to sharp, depending on the amount of involvement of the inner layers of the choroid and the amount and color of the pigment in the pigment epithelium.

3. The elevation is rarely sufficient to be measured clinically, although the choroid is usually thickened.

4. The size and shape do not change over long periods (five years) of observation. (Foster-Moore.)

5. The retinal pigment epithelium is not involved in the nevus.

Since sarcoma of the choroid tends usually to grow inward, one may expect to see some sign of pigmentary disturbance of the pigment epithelium over the nevus as an early sign of a beginning malignant condition from such a source.

W. Zentmayer.

Glaucoma

The Radical Treatment of Glaucoma by Sclero-Ciliarotomy with the Cautery. T. Fiore, Ann. di ottal. e clin. ocul. **57**: 820 (Oct.-Dec.) 1929.

After a somewhat extended review of the literature on glaucoma and on previous operations, the author describes a procedure carried out in all forms of glaucoma by his father and brother. With a fine

pointed Paquelin cautery, a furrow from 5 to 6 mm. long is made 1 mm. back of the upper limbus. It passes through the conjunctiva, sclera, iris angle and ciliary body and reaches the junction of the ciliary body with the choroid. The fluid escapes from both chambers, and the surface of the vitreous is exposed in the wound, but the vitreous loss, if any occurs, is minimal. A double bandage is used for six days. Healing is complete in about three weeks, leaving a small flat bluish scar. The author believes this is effective in three ways, by destroying part of the swollen ciliary body, by destroying some ciliary processes, so lessening the formation of aqueous and by establishing a filtering scar. He explains in this way its effectiveness in all stages of glaucoma.

The operation has been performed by the author and his colleagues 177 times on 129 persons, ninety-five with acute, twelve with chronic and thirty-eight with absolute glaucoma. Both eyes of a patient operated on for acute glaucoma with resulting normal vision and tension were obtained at his death five years later. They showed complete destruction of the iris angle, the canal of Schlemm, the ciliary body and the anterior portion of the choroid in the area of the cauterization. The wound was covered by scar tissue derived from the bulbar conjunctiva. Similar observations were made in three rabbits killed at various periods after similar operations. Nineteen cases from the author's series are reported in detail.

S. R. GIFFORD.

VASCULAR LESIONS IN PATIENTS WITH GLAUCOMA. C. ESPÍLDORA LUQUE, Arch. de oftal. hispano-am. **30**: 344 (Aug.) 1929.

This is the third of a series of papers on the general lesions to be found in patients with glaucoma, based on a ten years' observation of 300 patients with this condition, in Charlin's clinic in Chile.

The reports of numerous investigators show the frequency of vascular lesions of the eye in essential glaucoma, these being independent of the local hypertension. From the experimental point of view, they also indicate that the most efficient means of producing glaucoma artificially is ligature of the vorticose veins. All this suggests a pathogenic relation between an essential hypertension of the eye and lesions of the ocular blood vessels. It is logical, therefore, to conclude that if the anatomic substratum of glaucoma is a vascular lesion, the glaucomatous patient must be one with diseased blood vessels.

Apart from a special general examination of patients with glaucoma, all ophthalmologists have had occasion to note the intimate relationship between ocular hypertension and vascular lesions and the coincidence with glaucoma of such diseases as albuminuric and diabetic retinitis, typical vascular diseases.

In the previous papers, one notes the great frequency of vascular lesions in these patients, two special conditions leading toward them: the presence of syphilis, which appears as a predisposing factor in glaucoma and is so prone to vascular localization, and arterial hypertension, which is so frequent in glaucoma and is dependent on vascular lesions.

Of the 300 cases, 244 (82 per cent) presented vascular lesions, distributed as follows in the different age groups: 68 per cent in the juvenile group; 78 per cent in the mature and presenile group, and 88

per cent in the senile group, showing that in more than 50 per cent of the glaucomatous patients of all ages, vascular lesions are demonstrable.

The vascular lesions most frequently found were: chronic aortitis, arterial hypertension and, exceptionally, renal sclerosis (nephritis); it is surprising that in only one case was there found a lesion of the cerebral arteries manifesting itself by a hemorrhage into the internal capsule.

Chronic aortitis was the most frequent vascular lesion found. It was more frequent than arterial hypertension, the former being found in 62 per cent of the cases of glaucoma, the latter in 52 per cent, usually both lesions being found in the same patient. Its proportion in the different age groups was: (1) in the juvenile cases, 42 per cent; all of the patients were syphilitic and in half valvular lesions were present; (2) in the mature and presenile and in the senile groups, 63 per cent each; in the latter, most of the patients had arteriosclerosis and in the former, syphilis.

In connection with arterial hypertension, it is more than thirty years since Terson and Campos demonstrated arterial hypertension in glaucomatous patients. Later Vaquez, Fraenkel, Joseph and others not only confirmed this, but attempted to explain ocular hypertension as a consequence of the increase in blood pressure, Kummel going as far as concluding that the diagnosis of glaucoma signified the existence of a concomitant increase of blood pressure. None of the two groups are exact in their deductions, many cases of arterial hypertension showing normal ocular tension and many cases of glaucoma not being accompanied by any increase in blood pressure. The relation between the two processes is their common causation—an organic lesion of the vascular walls, complicated in many cases with aortitis, vascular sclerosis and nephritis, different localizations of the same vascular process.

As already stated, an increase in blood pressure was found in 173 of the 300 cases (52 per cent), distributed among the different age groups in the following proportions: juvenile cases, 32 per cent; mature and presenile cases, 58 per cent, and senile cases, 71 per cent.

No marked difference was found as to its frequency in acute or chronic cases or as regards sex. Exceptionally, the author found glaucoma connected with arterial hypotension; this was noted in five cases, three belonging to the juvenile group and two to the mature. Two of the five showed a positive Wassermann reaction, two had a chronic myocarditis and one had pulmonary fibrosis (tuberculous?).

The frequency of vascular lesions, especially of arterial hypertension, would lead one to expect that chronic nephritis would be frequent among these patients. Clinical observation did not confirm this, however, the condition being demonstrable in only five cases (15 per cent).

C. E. FINLAY.

TONOMETRIC EXAMINATION IN GLAUCOMA. A. BIRCH-HIRSCHFELD. Ztschr. f. Augenh. **70**: 1 (Dec.) 1929.

Birch-Hirschfeld advocates a tonometric examination three times daily, 7:00 a. m., noon and 8:00 p. m., of all patients having an increased intra-ocular pressure. A control record should be made before any treatment is instigated. He finds that a daily fluctuation of the intra-ocular pressure in glaucoma often precedes the other visible symptoms.

The daily variation in the pressure curve of a nonglaucomatous eye corresponds with the normal variation of the temperature curve. The pressure curve of a progressive primary glaucoma simulates the fever curve of a septic disease in its daily fluctuation. In absolute glaucoma the difference of daily variation may fluctuate as a pneumonia curve frequently does. A rise of the noon and evening intra-ocular pressure values is an unfavorable omen in glaucoma, and a rapid decline of pressure must be sought. If miotics do not relieve the increased tension, an operation should be resorted to.

The author notes that an increase in the intra-ocular pressure following a drop produced by miotics or operation is an unfavorable sign. When the daily fluctuation is high and there are no irregularities about the curve following operative procedure, the intra-ocular tension often comes down gradually to normal. Morning tensions should be taken instead of at noon and evening. It is important to take the tension of both eyes even though one is normal, for the glaucomatous eye shows a greater daily fluctuation. A rise in one shows a rise in the other. This is not true in secondary glaucoma.

A. M. YUDKIN.

Retina; Optic Nerve

EXTENSION OF GLIOMA (RETINOBLASTOMA) INTO THE OPTIC NERVE. A. B. REESE, New York Eye & Ear Infirm. Clin. Rep. **1**: 5 (March) 1930.

The paper deals with the results of examining globes enucleated for glioma, with the idea of determining the frequency of nerve invasion, the frequency with which the nerves are severed at operation, and the frequency of extra-ocular extensions. The specimens were from the collections of E. Fuchs, F. H. Verhoeff and B. Samuels, and the author's.

The microscopic examination of 119 eyes enucleated for glioma with no extra-ocular extensions showed that in sixty-three, or 52 per cent, the gliomatous tissue had invaded the optic nerve posterior to the lamina cribosa. Of these sixty-three cases, fifty-one, or 8 per cent, showed that the optic nerve had not been severed distal to the tumor extension. In other words, in 43 per cent of the 119 cases it was apparent that the outcome would be fatal before the patient left the operating room.

As cases of glioma usually prove fatal owing to optic nerve extension, and only exceptionally owing to metastasis, and as extra-ocular extension occurs late and in a small percentage of cases, a good opportunity is offered for complete eradication and cure at operation. That we fail to take advantage of this is evidenced by the fact that in 43 per cent of the cases that show no extra-ocular extension, the eyes are enucleated with the optic nerve not cut distal to the tumor invasion of the nerve. Cure could unquestionably be obtained in many of these cases if the nerve is severed as far back as possible. It is quite reasonable to expect that the nerve should be from 10 to 12 mm. long, or longer, but one of this length is rarely found in the laboratory. The average nerve is not over 3 mm. long. In view of the fact that 52 per cent of the cases with no extra-ocular extension show invasion posterior to the lamina cribosa and that 81 per cent show that the nerve has not been severed

distal to the tumor invasion, the following procedure is employed: in the laboratory, the nerve is immediately severed flush with the sclera and run through in forty-eight hours as tissue for biopsy. If gliomatous tissue is seen extending through the site where the nerve was cut at operation, the surgeon is notified. His choice would then probably rest between further nerve excision or radiation, or both.

W. ZENTMAYER.

RETROBULBAR NEURITIS FOLLOWING INFLUENZA. Vancea, Cluj. med., 1929, no. 9.

The first observation refers to a patient who was seeing a black dot in the left field of vision. There was a central and also a paracentral scotoma with dyschromatopsia. Vision was 5/10. The Wassermann reaction was negative. The nasal sinuses were normal. The nose was treated with epinephrine. After two weeks the scotoma had disappeared and vision was 5/5.

In the second case vision of the left eye was 5/5. A paracentral scotoma was present. The fundus was normal. The patient had an acute coryza, for which acetylsalicylic acid and epinephrine were given. After eight days, no scotoma was to be found. Vision was 5/7. After two weeks, there was complete recovery.

The author holds that complete recovery in a very short time after influenza is characteristic of retrobulbar neuritis.

N. BLATT.

FIRST ANATOMIC OBSERVATIONS IN HEREDITARY ATROPHY OF THE OPTIC NERVE (Leber's Disease). K. REHSTEINER, Schweiz. med. Wchnschr. **60:** 122 (Feb. 8) 1930.

Rehsteiner asserts that hereditary atrophy of the optic nerve was first described by Leber in 1871 and is therefore sometimes designated as Leber's disease. The disturbance is hereditary, but the persons affected with it usually have normal eyes and vision in early life. In the second or the third decade, visual disturbances develop which are progressive for some time and then remain stationary. Leber discovered the hereditary character of the disease. It was also noted that it occurred more frequently in men than in women. In one family, the sisters of the men who were affected transmitted the disease to their offspring, whereas they themselves did not contract it. The author reports the result of the anatomic examination of a patient who was affected with hereditary atrophy of the optic nerve. Up to the age of 39, the patient had had normal vision. Then visual disturbances developed suddenly, and examination revealed a scotoma, which in the course of the following months gradually affected a larger area. The two eyes were affected in almost the same manner. However, the periphery of the visual field was unimpaired. The patient died several years later of encephalorrhagia. Microscopic examination of the optic nerve revealed a primary atrophy of the nervous elements and a proliferation of the neuroglia. The arrangement of the connective tissue likewise showed marked changes. The pathologic conditions in the bulbus oculi were less severe than those in the optic nerve, but an atrophy of the ganglion cells was

noted in the central part of the retina. The location of the atrophic parts in the retina and in the optic nerve indicated that the atrophy affected mainly the papillomacular bundle. [J. A. M. A.]

MANIFESTATIONS AND COURSE OF JUVENILE EXUDATIVE MACULAR RETINITIS. PAUL JUNIUS, Ztschr. f. Augenh. **70:** 129 (Jan.) 1930.

A descriptive portrayal is given of the degenerative disturbance in the macular region of four cases. The etiology according to the history and clinical observations is variant. Similar retinal disturbances have been reported in the literature, but they have been classified differently. Junius believes that they belong in the group which he describes. The outstanding change seems to be in the vascular bed at the macula. He attributes the destruction of the tissue to an alteration of the metabolism in this area.

A. M. YUDKIN.

Neurology

ARGYLL ROBERTSON PUPILS IN POLYNEURITIS. J. M. NIELSEN and L. E. VERITY, Ann. Int. Med. **3:** 707 (Jan.) 1930.

A case is reported by Nielsen and Verity in which during the course of an acute polyneuritis, Argyll Robertson pupils, bilateral optic neuritis and bilateral Bell's palsy developed. The pupils became normal on the ninth day. Evidence is furnished by this unique case to show that Sven Ingvar's ideas of the pathogenesis of reflex pupillary immobility are correct.

[J. A. M. A.]

FUNDUS CHANGES IN TUBERCULAR SCLEROSIS OF THE BRAIN. F. VON HERRENSCHWAND, Klin. Monatsbl. f. Augenh. **83:** 732 (Dec.) 1929.

To the limited number of cases of this type described heretofore the author adds that of a woman, aged 27, who offered a series of defects in intelligence and character and suffered from epileptiform attacks. The symptoms developed after she was over 20 years of age.

The eyes presented the following changes in the fundus: In the right eye there was a small grayish-red elevation raised slightly above the level of the disk. It was well defined and round. A small brown spot, and another more peripheral white spot which appeared to be composed of fine glistening concretions were noticed. In the left eye, at the nasal margin of the otherwise normal disk, a retinal tumor was seen, of about ½ papilla diameter in size and nearly 3 papilla diameters high. Resembling a white brambleberry, this tumor had a humpy surface, apparently composed of glistening druses. Several vessels, the size of the macula vessels, sprang from the disk and entered the tumor, leaving it at the opposite side. One of these vessels remained on the surface and can be followed up to the top of the tumor. No other changes were observed.

K. L. STOLL.

Orbit, Eyeball and Accessory Sinuses

THE ERYSIPELOID FORM OF MALIGNANT STAPHYLOCOCCEMIA. G. RENARD, Arch. d'opht. **46:** 544 (Sept.) 1929.

This condition passes through three stages, the second stage being the most important from the point of view of diagnosis. A case is described which began with a furuncle of the nose, went on to extensive involvement of the skin of the lids and one side of the face and ended with marked exophthalmos due to infection of the cavernous sinus as shown at autopsy. The differential diagnosis from erysipelas can be made from the careful observation of the skin. The affected area is violet blue, painful and covered with vesicles of varying size filled with pus from which pure culture of the staphylococcus can be obtained. There is no characteristic limiting border; the greatest tenderness is at the center rather than at the periphery of the plaque. There is no elevation of the local temperature. All parts are in the same state of infiltration in contrast to the advancing border in erysipelas. Alarming general symptoms arise during this second stage. The third stage comes on quickly and consists of signs of cavernous sinus thrombosis. Up to the present time no treatment has offered much hope of cure, although a few patients have survived.

S. B. MARLOW.

General Disease

THE STATUS OF FOOD POISONING IN RELATION TO OPHTHALMOLOGY. C. M. SWAB, Am. J. Ophth. **12:** 949 (Dec.) 1929.

Botulism alone is considered because of its relation to the eye. This is usually regarded as the result of eating food containing the botulinus toxin, elaborated by three types of organism, namely A, B and C. According to Van Ermengun, the botulinus syndrome consists of neuroparalytic symptoms (ptosis, mydriasis, paralysis of accommodation, diplopia, internal strabismus). The work of several other authors is also discussed.

There was no apparent relation between the symptoms of salivation and excessive lacrimation in dogs. Two of the seven dogs used had oversecretion of saliva, but as there was dysphagia in every case it was difficult to tell whether the driveling of saliva was due to this or to oversecretion. Dryness of the eyeballs with deep intoxication occurred almost simultaneously with loss of the normal winking reflex. In four of these animals there was a dull central opacity of the superficial layer of the cornea. There was pupillary widening in all instances, but the reaction to light occurred until a short time before death. Finally, there was total loss of the light reflex. There was no salivation or excessive lacrimation in any of the rabbits. Dysphagia was a constant observation. Dryness of the corneas was found in all cases but one, as was also pupillary widening. In one rabbit nystagmus and temporary convergence developed; another showed marked sympathetic irritability. The guinea-pigs, cocks and white rats were unsatisfactory as experimental animals.

In a previous report it was shown that the toxin of *Clostridium botulinum* is a protoplasmic poison to peripheral and striated muscle tissue, being more selective in its effect on the former. It has also been suggested that it is a general protoplasmic poison.

The histologic observations in the nuclei of the third and fourth cranial nerves were: round cell infiltration, lymphoid cells packed into the parenchyma, extravasation of red blood cells, distention of capillaries with erythrocytes, stagnation of blood, migration of lymphoid cells, thickening of capillary endothelium, neuronophagia, chromatolysis, satellitosis, necrobiosis, nuclear displacement, nuclear shrinking, vacuolization, powdery granulation of Nissl bodies, complete disintegration of the ganglion cells and increase of neuroglia. Similar changes were noted in other parts of the midbrain.

Besides a diffuse small round cell infiltration beneath the ependymal lining of the third ventricle, there were diffuse round cell infiltration and massive extravasation of erythrocytes in the meninges. The meningeal vessels were distended with red corpuscles. Thrombosis was not frequent in the midbrain. In the optic nerves the observations included focal infiltration in the parenchyma, diffuse increase of neuroglia, and round cell infiltration of the pial and arachnoidal sheaths. In the optic tracts were found round cell infiltration, extravasation of erythrocytes, emigration of lymphoid cells, and stagnation of blood. In the chiasm the observations were maximal infiltration, excessive packing of lymphoid cells in the parenchyma and marked extravasation of red cells.

The retinal observations were: fat formation in the ganglion cell layer; pyknosis, chromatolysis and vacuolization of the ganglion cells; a powder-like reduction of the pigment granules; engorgement of the vessels with red corpuscles and stagnation of blood. In the choroid there was maximal infiltration involving all layers. There was round cell infiltration of the corneoscleral junction. In the ciliary body there was round cell infiltration together with an increase in the connective tissue element.

The exudative lesion consisted chiefly of lymphocytes and monocytes some of which had differentiated into polyblasts and others into plasma cells. The exudate occurred mainly around the vessels, but there was often a tendency to migration into the parenchyma. Where maximal infiltration was noted, as many as fifteen rows of lymphoid cells were present around the vessel.

W. S. Reese.

Lipemia Retinalis in a Diabetic. C. E. G. Shannon, and H. K. Mohler, Am. J. Ophth. **12:** 980 (Dec.) 1929.

The authors discuss metabolism in diabetes in relation to lipemia retinalis and remark the rarity of this ocular manifestation. The case of a man, aged 42, is reported who presented the classic symptoms of diabetes when first seen in 1921. He did well on a regulated diet until November, 1928, when he was admitted to Jefferson Hospital. He was dull and drowsy, and had the odor of acetone on his breath. The urine showed a decided trace of albumin, 3.3 per cent sugar, and acetone and diacetic acid. The blood showed 235 mg. of sugar, and the carbon dioxide combining power was 33.97 cc., found as sodium bicarbonate per hundred cubic centimeters of plasma. A specimen of blood had a creamy appearance and separated into an upper half of a creamy color and a lower half of a dark brown appearance. An ophthalmoscopic examination was made the day following admission and revealed the

characteristic picture of lipemia retinalis. Under appropriate treatment, the patient became sugar-free on the fifth day after admission, and at the same time the retinal vessels assumed a normal appearance.

The authors also discuss lipemia retinalis and the theories of the characteristic fundus picture, notably that of Foster Moore. They refer to the wide variation in the percentage of blood fat, the effect of insulin, and the higher incidence in males.

W. S. Reese.

Tumors

Sarcoma of the Iris. M. S. Mayou, Brit. J. Ophth. **14:** 152 (April) 1930.

According to the author there are about 100 cases of sarcoma of the iris on record. They may be pigmented or unpigmented. In the pigmented group there are those which definitely start in large pigment nevi which have been noted beforehand or those which are supposed to start in the stroma of the iris. In nearly all cases the tumor consists of large spindle cells. Such cells are characteristic of growths of nevus origin, and it is probable that those supposed to originate in the stroma have their origin in unnoted nevi.

It is most frequent between the ages of 35 and 55, and a little commoner in females than in males. Most frequently the lower part of the iris is affected. It is often difficult to tell whether the growth originates at the root of the iris or in the neighborhood of the ligamentum pectinatum of the ciliary body since the latter becomes rapidly involved. When the tumor is on the surface of the iris it may be brown or deep black. There is a strong tendency for the tumor to spread around the angle of the chamber and produce hypertension. In other cases the angle of the chamber does not become "sown" with malignant pigment cells, and the growth may attain a large size without glaucoma supervening.

In case 1, a large pigmented nevus of the iris became malignant. The patient, a male, had noticed a mass on the iris for years. It was situated on the outer side and a little below the horizontal meridian. It was watched for seven years, and the patient was not again seen for thirteen years after the first visit. The spongy growth had increased in size, blocked the angle, and pressed on the cornea. Tension was + 1. The eye was enucleated. The growth had invaded the canal of Schlemm and had extended around for the greater part of its circumference; it involved the fibers of the pectinate ligament and extended backward into the ciliary body. The tumor consisted of large cells of the endothelial type with a large quantity of pigment cells. It was very vascular and contained large lymph spaces. It was a large pigmented nevus of the iris just becoming malignant.

Case 2 occurred in a man, aged 45, in whom a diagnosis of sarcoma was made. In the right eye, which was the seat of an old iridocyclitis, there were two raised swellings in the iris. Tension was + 1. By transillumination the swellings appeared translucent. This led the author to make a diagnosis of epithelial cyst. The eye was twice trephined, but was ultimately removed. There were circumscribed swellings of the iris blocking the angle. The whole anterior part of the iris was deeply pigmented. The growth arose from the root of the iris and had involved

Schlemm's canal, spreading around the angle of the anterior chamber to the greater part of its circumference.

The tumor consisted of large spindle cells of the endothelial type. Nearly all the cells contained pigment. These large cells seem characteristic of sarcoma of the iris whether it originates from a nevus or not.

In case 3, a woman, aged 48, had noticed a spot on the right eye at the upper inner sector of the iris for twelve months. It occupied about one third of its circumference. The eye was enucleated. A large growth was found occupying nearly the whole breadth of the iris and the anterior part of the ciliary body, invading Schlemm's canal. The tumor consisted of large endothelial-like cells, both pigmented and nonpigmented. Toward the pupillary margin, it showed considerable degeneration.

In case 4, a man, aged 44, presented a large brown nodular mass in the anterior chamber on the nasal side. Tension was normal. The eye was enucleated. The tumor occupied the whole breadth of the iris and ciliary body and spread into the choroid. The ciliary body was completely atrophied and the tumor was invading the retina in the region of one serrata. The growth consisted of large endothelial cells containing a considerable amount of pigment.

The author points out that the early involvement of the canal of Schlemm, leading to hypertension, is of great importance from a diagnostic point of view since it may be the only means of distinguishing an innocent from a malignant tumor. Loss of mobility of the iris as a diagnostic point could not be verified. Although the cases presented varying clinical aspects the histologic changes, so far as the cytoplasm of the cells is concerned, are similar, a fact which suggests that most of them have their origin in nevi. The article is well illustrated.

W. ZENTMAYER.

Injuries

REPORT ON EXAMINATIONS FOR INTRAOCULAR FOREIGN BODY. G. S. DIXON, New York Eye & Ear Infirm. Clin. Rep. **1**: 3 (March) 1930.

From 1904 to 1929, 6,120 x-ray examinations were made; of this number, 34.79 per cent gave positive results. There were 11.6 per cent more injuries to the left than to the right eye. The intensity of the shadow cast by various substances decreases in the following order: lead, steel, iron, copper, brass, stone or sand, plumbago (pencil lead) and glass. A roentgenogram should be made of every injured eye.

Forty-two years is the longest time here recorded for the retention of a foreign body. A prolapsed iris may indicate, but not necessarily mean, that there is no foreign body in the globe. Any unanchored foreign body may change its position in a fluid vitreous.

W. ZENTMAYER.

Operations

GONIN'S OPERATION IN DETACHMENT OF THE RETINA. J. IGERSHEIMER, Deutsche med. Wchnschr. **55**: 2177 (Dec. 27) 1929.

Igersheimer describes a therapeutic method for cases of detachment of the retina, which has been employed by Gonin during the last five

or six years. The author likewise employed this method. He gives a detailed report of three cases in which the operation brought favorable results. The new aspect of Gonin's method is that the fissure formation is considered the main factor in the pathogenesis and in the treatment of spontaneous ablatio retinae. It is sometimes extremely difficult and tedious to locate the fissures, although this is possible in the majority of cases. The essential part of the operation is that in the fissure a posterior sclerotomy is performed and through the scleral opening cauterization is done deep into the vitreous body. Indications and contraindications to this treatment are as yet not definitely defined, but it is certain that the results are more favorable if the operation is performed early. It is possible that in the future the technic of Gonin's operation will be somewhat modified. However, it can be stated that in its present form it already represents a marked advance over the older methods. The description of the three cases illustrates the practical value of the operation.

[J. A. M. A.]

Therapeutics

THE TREATMENT OF HEMERALOPIA AND KERATOMALACIA BY THE FEEDING OF LIVER. TRANTAS, Arch. d'ophth. **46:** 551 (Sept.) 1929.

Thirty years ago the author first reported his successful treatment for hemeralopia and keratomalacia with liver. His subsequent experience with this form of treatment has impressed him with its great superiority over all others. In spite of this, only a few authors have reported its use and not one textbook mentions the use of liver in the treatment for these conditions. The work of Minot and Murphy and the experiments of Whipple offer a possible explanation for its mode of action. The author suggests that this form of treatment can be applied profitably to other ocular conditions. He has already begun to recommend it in cases of retinal hemorrhage in adults and in retinitis pigmentosa.

S. B. MARLOW.

EXPERIMENTS WITH MEDICAMENTS INTRODUCED INTO THE ANTERIOR CHAMBER. B. VON PELLÁTHY, Klin. Monatsbl. f. Augenh. **83:** 758 (Dec.) 1929.

The correct selection of the remedies and the difficulty of judging accurately the amount of irritation produced by them render this method risky. Experiments with rabbits have been made by the author. He injected 0.2 cc. of the solutions near the limbus into the anterior chamber after the removal of an equal quantity of aqueous humor with the syringe. Atropine and pilocarpine were not used on account of their influence on the albumin in the chamber. The eyes had been anesthetized with cocaine, strict asepsis being observed.

Fibrin appeared in the chamber after each injection, its quantities depending on the amount of irritation produced by the divers solutions. The fibrin is not considered pathologic, as it will appear even after removing the aqueous humor. Clouding of the endothelium and of the parenchyma of the cornea, seen after most of the injections, may be dis-

regarded. The eyes were infected with *Staphylococcus aureus* and *citreus*, pneumococcus, streptococcus, in doses of 0.03 cc. of a pure culture grown on bouillon. This equals about 25,000,000 to 50,000,000 bacteria. The fibrin, observed in the chamber after the injection of sterile water, or of a 2 per cent or a physiologic solution of sodium chloride, or 1 per cent solution of sodium bicarbonate, likewise other formed elements noticed thereafter and changes near the puncture disappeared within a few days. Silver preparations may produce severe opacification of the cornea, uveitis, or even buphthalmos. Ethylhydrocuprein hydrochloride caused uveitis and affected the lens. A flavine dye and acriflavine caused slight and transient irritation of the iris while the function of the eyes remained unchanged. The eye will withstand these two preparations best of all bactericidal remedies if injected into the chamber.

The author succeeded in ameliorating but not subduing intra-ocular infections by injecting acriflavine. Considering the fact that extremely severe infections were intentionally given, better results are expected in treating the commonly slighter infections, especially under a simultaneous general treatment.

K. L. STOLL.

General

PREGNANCY AS A CAUSE OF DISTURBED VISION. J. ROSENBAUM, Canad. M. A. J. **22**: 64 (Jan.) 1930.

In the three cases reported by Rosenbaum, primary optic atrophy, retrobulbar neuritis and secondary optic atrophy are attributed directly to pregnancy. A fourth case of cataract formation and a fifth of chronic glaucoma are more or less borderline cases, and while many factors may have had some influence in the production of the changes, from the history of the patients Rosenbaum thinks that they should properly be placed under the heading of complications of pregnancy.

[J. A. M. A.]

OCULAR COMPLICATIONS FOLLOWING THE USE OF ARSENICALS. F. TERRIEN, Arch. d'opht. **46**: 513 (Sept.) 1929.

Terrien calls attention to the not infrequent harmful effects from the use of the various arsenicals in the treatment for syphilis. He follows closely the grouping of these cases used by Zimmerman. The first group is made up of the toxic effects which consist mainly in the production of a localized congestion involving all the structures of the eye: conjunctival hyperemia, circumcorneal infection, corneal and scleral changes, iridocyclitis, myopia, retinal hemorrhages and choroidoretinitis. He discusses the myopia that occurs in rare cases. This he thinks is best explained by ciliary spasm due to congestion. The second group shows the Herxheimer reaction. In discussing interstitial keratitis the author agrees with Zimmerman that treatment neither provokes nor prevents its onset. Iritis and iridocyclitis may be made worse. In cases of optic neuritis with edema and hemorrhage the danger of repeated infections is emphasized. The author also points out the much greater danger of this form of treatment in cases of optic atrophy on a tabetic

basis. He discusses the theoretical explanations as to why cases of neuritis respond well to treatment while those of atrophy do not. He suggests that it may depend not only on the strain of organism and the resistance of the patient but also on anatomic considerations relative to blood and lymph supply. He suggests that interstitial keratitis offers some proof of the rôle played by stagnation and sluggishness of the circulation in the lack of efficacy of treatment. Not only is arsphenamine almost always ineffectual in the treatment for optic atrophy but it is also sometimes fatal. The only treatment of any value is prophylactic: the careful use of proper treatment when the first symptoms of the infection appears.

The third group of cases comprises those with relapses affecting the nervous system. Ocular disturbances are much less frequent than those affecting the eighth nerve. Optic neuritis with hemorrhages and swelling of the disk may be seen. A central scotoma is a common observation. A case that responded to mercurial treatment is reported. Iritis, iridochoroiditis, and paralysis of the muscles are also sometimes seen.

The author expresses the opinion, based on his personal observations and the number of cases reported in the literature, that these complications are much too frequent. The best prophylaxis he thinks is great caution in the use of the arsenicals. They may be used in cases of serious lesions of the cornea and uveal tract which do not respond to other forms of treatment. They are best omitted, never to be used a second time, in cases in which the optic tract is involved.

S. B. MARLOW.

Society Transactions

THIRTEENTH INTERNATIONAL OPHTHALMOLOGICAL CONGRESS

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ABSTRACTED BY PERCY FRIDENBERG, M.D., NEW YORK

ETIOLOGY AND NONOPERATIVE TREATMENT OF GLAUCOMA. DR. W. S. DUKE-ELDER, London.

Increased tension in glaucoma is not the essential factor, but an expression of disturbed thermodynamic equilibrium (Donnan) decided by the interrelation of capillary blood pressure, osmotic tension of blood plasma and aqueous, and by the volume of the globe contents. The latter has osmotic, hydrostatic and electrostatic equilibrium with the capillary plasma. Intra-ocular pressure is maintained by the equilibrium between the hydrostatic pressure in the capillaries less the difference in osmotic pressure between the aqueous and the capillary plasma. Hertel has shown that decreasing the salt content of the blood and, so, its osmotic pressure, causes increased intra-ocular tension, and vice versa. The vitreous, as shown by the ultramicroscope, is a gel, its constituents, those of the aqueous plus a mucoprotein, giving transparency, and a residual protein causing jellying. Increased alkalinity causes swelling; increase in acidity, shrinking. Little is known about the physicochemical changes in the vitreous which form, undoubtedly, one of the two main factors in the pathogenesis of glaucoma. The capillary circulation, on the other hand, is better understood. It is influenced by local and general disease of the vascular system, disorders of metabolism, toxemias—renal, intestinal or of focal infectious origin, disturbances of the sympathetic nervous system and endocrine glands, emotional disturbances, and by some specific toxin, such as histamine. Hence, the rational treatment for glaucoma is essentially medical. In most cases surgical procedures are palliative but effectual, and cannot be replaced by medical treatment.

DISCUSSION

DR. S. HAGEN, Oslo, Norway: From the clinical point of view the physical relation between filtration into the episcleral veins via the filtration angle and the secretion or ultrafiltration of fluid from the ciliary processes should be stressed. Plus tension may be due to lowered filtration or increased secretion from the intra-ocular capillaries. In simple glaucoma there is a typical curve with increase of tension at night. A reverse (atypical) curve is less frequent, and is generally seen in secondary glaucoma. The first suggests diminished filtration; the reversed curve, hypersecretion. Experimental study of the tension curve by procedures affecting the pupil and ciliary body or the intra-ocular circulation would be instructive. Miotics are probably of most value in high tension due to interference with the filtration angle,

although contraction of the pupil and consequent deepening of the anterior chamber may be only one of the factors. Naturally, they do not accomplish much when plus tension is due to hypersecretion or to a kind of mechanical interference with drainage by corpuscular elements in the aqueous or increased colloid (albumin?) content. Here, the intraocular vessels must be attacked (1) by epinephrine which diminishes secretion (by toxic action on the ciliary epithelium, according to Seidel) by ergotamine which probably acts, less vigorously, by contraction of the vessel alone. The influence of the sympathetic nervous system, certain hormones, and possible systemic products must be considered, all in relation to the two main physical factors discussed.

Dr. A. P. Magitot, Paris: High tension and changes in the disk do not run parallel; either may be present without the other. This applies, throughout, to each of the clinical symptoms. Glaucoma is essentially and fundamentally an edema. Besides the usual factors, circulatory, retentional, histologic, and the changes in osmotic equilibrium and p_H concentration, we must consider nervous, hormonal, toxic and infectious influences and, finally, the rôle of cellular autolysis. Altered permeability of the capillary walls, predisposed to by angiosclerosis or special irritability of the nerve supply, is the main point in pathogenesis. General treatment is of the greatest importance. Eserine and pilocarpine, used locally, lower the permeability of capillaries, but epinephrine may supplement these miotics or replace them temporarily. Ergotamine, acetylcholine and endocrine products given internally may also have a local action. Disturbances of metabolism and elimination must be corrected; cardiovascular disease, hereditary or acquired syphilis, disturbances of liver function or of the ductless glands, must be taken into account. Salt-free diet and restriction of fluid intake are of importance therapeutically.

Dr. K. Wessely, Munich: The old topographic-mechanical and physical theories of glaucoma were complicated, but not replaced by modern views of physical chemistry, endocrine balance, metabolism, emotional factors, etc. No one factor or theory dependent on it can explain the protean manifestations and reactions of this disease. In the last instance we get back to the eye and the tissues of the eye. Somatic factors cannot always be kept separate from local causes, and it is most dangerous to let treatment be influenced by preconceived ideas as to the etiology or pathogenesis. Local measures are still essential and invaluable, the miotics, especially. Epinephrine is of restricted application as are ergotamine and organtherapy. Justifiable research in constitutional treatment must not supplant the experience and success of operative procedures or, through fear on the part of the patient or overcaution and excessive operative conscience on the part of the surgeon, allow the moment for intervention to be missed.

Dr. L. Lacat, Paris: Dr. Lacat stressed general condition, citing hemorrhagic glaucoma and the form associated with choroiditis. He said that retrobulbar injections of epinephrine (Fromaget) or artificial lowering of blood pressure, as well as the administration of quinine, are of value in acute attacks, and that the same may be said of extirpation of the superior servical ganglion and the use of calcium chloride and of ergotin (Abadie).

DR. H. HERBERT, Brighton, England: The cause of glaucoma is purely anatomic: (1) lack of motility of the root of the iris in accommodation as a result of protrusion of the ciliary body behind the filtration angle; and (2) distortion of a (congenitally) excessively peripheral angle by retraction of the radial portion of the ciliary body.

DR. A. TERSON, Paris: Glaucoma is not infectious, but it is toxic and neuropathic. Acute glaucoma is "neurotic" and comparable to acute edema of the lungs, kidney and skin. The hemorrhagic form is a complicated arteriosclerosis. Adhesions of the filtration angle complicate the matter. All points, local and constitutional, must be considered.

DR. A. KESTENBAUM, Vienna: In dilatation of the pupil in the presence of a small circumlental space, the posterior chamber should be blocked. Miotics act less by deepening the anterior chamber and opening the filtration angle than by pulling the iris forward and freeing the posterior chamber. A shallow anterior chamber is primarily caused by bulging forward of the septum (zonule, lens, iris) between the anterior and the posterior segments. Of course, this adds to the difficulty of filtration. Epinephrine acts beneficially by making the iris comparatively bloodless. In another class of cases, in which miotics are of little avail, there is lowered permeability of the other septum (zonule, ciliary body, etc.).

DR. V. GROENHOLM, Helsingfors, Finland: After the use of epinephrine, a lowering of tension was noted in more than half the cases, lasting from one to four days. Eleven of sixty-one eyes reacted with increased tension; fourteen not at all. The best results were obtained in simple glaucoma; the worst in inflammatory glaucoma. Miotics are decidedly more effectual. Ergotamine tartrate (Werner) had very little action. Pressure bandage and massage act temporarily, but may be of some use in connection with other measures.

DR. M. ROSSI, Rome: I should like to refer to studies in constitutional disturbances and to Angelucci's (1881) vascular theory of the genesis of glaucoma. It is a "vascular shock" with colloid edema in consequence of capillary paralysis and changes in the vessels. Simple glaucoma is the result of a chronic capillary disease.

DR. F. TERRIEN, Paris: In hypertension without glaucoma due to fine precipitates, visible with the corneal microscope, which block the channels of filtration, there is no edema of the vitreous. Miotics act beneficially by increasing the permeability of the capillaries, not by any stretching of the iris or opening up of the iris angle.

DR. A. THIEL, Berlin: "Glaucoma without increased tension (Elschnig) is a term to be avoided, as real pathologic increase of intraocular tension has been noted in the later stages of these cases (von Hofe). Pseudoglaucoma may be induced by a so-called atrophic excavation of the nerve head, as seen in tumors of the base of the brain (hypophysis) and in arteriosclerosis of the internal carotid. Stereoscopic roentgenography of the skull aids in the diagnosis in these cases.

DR. C. HAMBURGER, Berlin: I have had good results with the epinephrine substitute glaucosin. Operation, while of value for the time being, does not affect a cure.

DR. R. SONDERMANN, Freiburg, Germany: I found the blood pressure in the venae vorticosae (intrascleral portion) from 25 to 30 mm. of mercury higher than that in the retinal veins. This gives a firm basis for the theory that intra-ocular tension corresponds to the difference between the hydrostatic pressure of the capillaries (especially in the uveal tract) and the colloid-osmotic pressure in the blood. This difference can be explained only by interference with venous off-flow through the sclera. This may be offset by compensation in secretion or filtration, but if the latter factors are but slightly affected, the factor of senile sclerosis of the sclera may become all important.

DR. RODRIGUES DE MORAES, Brazil: I think that the infectious processes in the sinuses, particularly the antrum, are of etiologic importance. In infantile glaucoma, buccopharyngeal and nasomaxillary pathologic processes must be considered. The latter cause irritation of the infra-orbital nerve, and resection is often followed by marked improvement.

DR. A. PASSOW, Munich: Fresh serum from patients with glaucoma contains substances which act as does animal overfeeding with thyroid substance. Relative overweight in many patients in spite of increased basal metabolism is due to disturbance of fluid elimination, which is also strikingly evident in glaucoma (anomalies of vascular equilibrium and adjustment, tendency to retention of tissue fluids). Glaucoma is hyperthyroidic.

DR. FRACASSI, Arezzo, Italy: Glaucoma is an edema of the eye due to vascular disease, organic or functional, with persistent or occasional insufficiency of off-flow. In hypotony, there is insufficiency of inflow (secretion). Both disturbances may be noted, alternately, in the same eye.

DR. C. HAMBURGER, Berlin: Efforts should be made to find an inflammation which will cause a softening of the glaucomatous eye so that it does not need to be opened by operation.

DR. A. ELSCHNIG, Prague, Czechoslovakia: Hamburger cauterizes the sclera to reduce tension. Lagrange suggested the same procedure to raise it!

DR. C. HAMBURGER: It would not be the first time that a procedure has been advised for two diametrically opposed purposes. I am not aware that Lagrange ever presented measurements or curves.

DR. HILDESHEIMER, Berlin: It is not possible to set up a radical contrast between glaucoma and intra-ocular inflammation. Iritis or iridocyclitis with plus tension is particularly difficult to treat, as is well known. In almost all cases of glaucoma, of whatever type, we find some indication of slight inflammatory processes. A fresh irritation may favorably influence a pre-existing condition, for example, a subconjunctival injection of procaine hydrochloride-epinephrine in scleritis of obscure origin. If a small pustule develops at the site of the injection, the improvement is particularly noticeable and rapid.

DR. HAMBURGER: There is a combination of (iris) inflammation and glaucoma, so that they are not mutually exclusive, but this is only apparent. High tension in iritis usually runs a mild course and passes off. It is the stadium incrementi. All inflammations start in this way.

It is only later on and gradually that the marvelous regulatory mechanism comes into play by means of which the eye, overloaded with blood, serum and fibrin, becomes soft, instead of hard like all other inflamed organs. Often enough, tension falls below normal, even in the other eye, as well. The case of chronic uveitis is different. Here nature accomplishes much less, as in all chronic diseases. Eserine at once causes marked hyperemia, and glaucosan produces the same effect indirectly. Anything which increases metabolism in the eye reduces intra-ocular tension.

PATHOGENESIS OF ACUTE GLAUCOMA. DR. FRIEDENWALD, Baltimore.

This article appeared in full in the May issue **3**: 560, 1930.

EXPERIMENTAL STUDY OF THE PATHOGENESIS OF ACUTE GLAUCOMA. DR. FRIEDENWALD AND DR. PIERCE, Oxford, England.

This article appeared in full in the May issue **3**: 574, 1930.

EPINEPHRINE AND TENSION. DR. BONNEFON, Bordeaux.

Retrobulbar injection of fluid regularly produces a partial and transitory ophthalmomalacia comparable to that following medium strong pressure on the anterior section of the globe. In dynamic increase of tension, retrobulbar injection of epinephrine acts by vasoconstriction and causes a varying diminution of tension. In static increase, the epinephrine acts only mechanically, i. e., like any other mass of fluid. In most cases of chronic glaucoma, these reactions are similar to those in normal eyes. But in glaucoma with marked increase in tension, and particularly in absolute glaucoma, there is decidedly less action toward lowering tension. Indeed, tension may be increased. These facts show that variations in tension in the normal eye and those in static plus tension are exclusively a function of (1) compression working on the globe from behind, forward, and (2) the filtration rate in the anterior segment.

DISCUSSION

DR. W. COMBERG, Berlin: There should be international regulation and calibration of tonometric measures and instruments, uniform standards, comparison of various instruments with direct manometric measurements, simplified adjustment and after-tests. Concerted action of ophthalmologists to ensure better and more uniform products from the manufacturers is urgently requested.

DR. R. KERRY, Montreal: Hyperemia of the ciliary body forces the latter to protrude into the posterior chamber like a wedge, pressing the ciliary processes against the iris. Insufficiency, later obstruction of the ligamentum suspensorium and the ligamentum pectinatum, is the next step, leading to hypertension.

METHOD OF RESECTION OF THE SCLERAL FLAP. DR. VELTER AND DR. DUVERGER, Paris.

Resection of the scleral flap (in sclerecto-iridectomy) with a scalpel ensures a well functioning permanent fistula. To guard against per-

foration of the conjunctival flap, the latter is dissected loose, upward from the limbus, allowing the operative field to be seen more clearly, and then later, drawing the flap down and suturing it in place.

DISCUSSION

Dr. A. Elschnig, Prague: I think it unjustifiable to discard cyclodialysis. Particularly in the purely compensated form (glaucoma simplex) it is by far the best procedure and is devoid of danger, even if the field has been contracted almost to the fixation point. But the detachment must include almost half of the angle of the anterior chamber and must be carried back to a point back of the ciliary body.

Galvanocautery in Glaucoma. Preziosi, Malta.

This procedure is to replace the trephine as a means of puncturing. The cautery is used to dissect up a conjunctival flap (!) and then puncture the sclera at or near the limbus. The results in 114 cases of various forms of glaucoma were satisfactory. Vision was retained or improved; pain and tension were diminished. Miotics were rarely used after operation. Hypotonia was noted rarely; late infection, never.

DISCUSSION

Dr. C. Hamburger: In regard to my theory of the antagonism of glaucoma and intra-ocular inflammation, Preziosi's ignipuncture really acts by producing an inflammation. The results bear out my contentions.

Dr. M. Amsler, Lausanne, Switzerland: In two cases of absolute glaucoma pain and tension were relieved and enucleation avoided by perforation of the sclera with the thermocautery.

Dr. M. Meyerhof, Cairo, Egypt: Anterior sclero-iridotomy is done in desperate cases. Advanced primary and secondary glaucoma is common in Egypt, and the usual treatment and operative procedures fail. In such cases, especially if there is no anterior chamber, sclerotomy—possibly to be repeated—and incision of the root of the iris and of the anterior synechiae often save the eye and permanently relieve pain. In twenty cases reported the patients were under prolonged observation.

Modified Elliot Operation. Dr. Szymanski, Wilna, Germany.

Szymanski's trepan is large (3 mm. in diameter). Applied obliquely it cuts out a semicircle, with a 3 mm. base, 1.5 mm. high, but the fistulous opening is narrower (less than 1 mm.) because the trephine, held parallel to the surface of the iris cuts at a sharp angle. Two hundred patients with simple and chronic glaucoma were operated on by this method, almost without complications. In subacute cases a broad iridectomy must be added. The technic is as follows: The conjunctival bleb flap is raised by injection of procaine hydrochloride-epinephrine and dissected up, away from the limbus. Open conjunctival suture is prepared. The scleral flap is pared off with scissors. This is followed by iridectomy and reposition of the iris. Suture is tied, bringing the conjunctiva down and covering the fistula.

DISCUSSION

Dr. L. Pines, Warsaw, Poland: Dissection of the conjunctival flap from the limbus upward, the direct opposite of the Elliot procedure, allows the flap to be thickened at the expense of the episclera and effectually guards against the possibility of late infection. The crescentic or half-moon trephine opening running like a funnel toward the anterior chamber prevents any possible injury of the ciliary body, or the loss of the excised scleral disk in the anterior chamber. The sclera not only is bored through but is flattened in the adjacent area. The failure to produce a bleb in Elliot's operation even when perfectly performed is due to unusual length or pathologic hypertrophy of ciliary processes which may get into the hole and plug it up. This is impossible in Szymanski's operation as the trephine opening does not come into contact with the ciliary body. I use a fine trocar instead of the stilet of the trephine. After the point has been engaged it is unscrewed and boring with the trephine quietly proceeds.

Dr. W. Reis, Lemberg, Poland, and Dr. Lauber, Vienna: We have had good results with Szymanski's procedure.

Myopia. Dr. Fracassi, Arezzo.

Axial myopia often presents a clinical picture like that of ocular syphilis. Previous and family history as well as physical examination confirm this impression. Specific treatment with mercury, bismuth and a brand of arsphenamine is well borne and often produces excellent, or even brilliant, results.

Myopia in School Children in Portugal. Dr. Moutinho and Dr. Mattos, Lisbon, Portugal.

Marked diminution in frequency has been noted since rules of hygiene have been generally enforced (1907, 21 per cent; 1929, 12 per cent). The largest number of cases of myopia is found in the upper classes. Only one third of ametropic school children had had glasses prescribed. Myopia may develop from emmetropia, even at 15 or 18 years of age. It is more frequent in girls than in boys.

Topography of Disk in Myopic and Other Eyes. Dr. R. Scheerer, Tübingen, Germany.

Examination of 100 eyes shows that changes supposedly due to traction may be seen in all forms of ametropia. Furthermore, these changes are not uniform and not invariably more intense on the temporal side of the disk as generally claimed. The various crescents, thinning of the choroid, conus, stretching of lamina elastica, distraction and supertraction about the disk, are not necessarily due to traction, as many of these eyes are small and have a normally thick sclera, and the changes may be more marked on the nasal than on the temporal side. There is evidently no uniform mechanical or "architectonic" factor, and it becomes necessary to study the topography of the nerve entrance from the embryologic point of view.

AMBLYOPIA EX ANOPSIA. DR. H. M. MORTON, Minneapolis.

The term is a misnomer. The congenital visual defect is due to scarcity or faulty function of the rods and cones. Adaptation is rapid. Fields are normal. Sensitivity of the macula is reduced. Glasses are of little use. The amblyopia is the cause, not the result, of nonuse.

DISCUSSION

DR. C. H. SATTLER, Königsberg, Germany: In a number of children with alternating squint and equally good vision in either eye, when the squint became limited to one eye, the vision of that eye dropped down until there was marked amblyopia. The same thing is often noted after covering the fixing eye for a time, and thus correcting the amblyopia-squint of the fellow eye, and making it fix the object. The originally fixing eye took on a squint position and showed marked amblyopia. In these cases, without a doubt, the squint position is the cause, and amblyopia from suppression of the image, the result.

DR. F. A. JULER, London: I have noted that traumatic cataract produces monocular amblyopia in children less than 5, but not after the age of 7. This speaks for amblyopia ex anopsia. Cone blindness is the explanation of congenital color blindness, and these cases are not nyctalopic. It is difficult to understand how such a defect could explain amblyopia with convergent squint.

DR. H. BARKAN, San Francisco: I use Marlow's method of occlusion of one eye for from twenty-four to thirty-six hours, before testing with the Maddox rod in cases in which vertical deviation is suspected. In more than 1,000 cases a previously undetected hyperphoria, up to 8 prism diopters, was revealed. Correcting prisms relieve the condition, usually at once.

DR. C. H. SATTLER, Königsberg, Germany: I add prisms, up to 20 degrees, to the refraction corrections in children with squint and am able to get binocular vision with good depth perception, and increase of fusion impulse and greater fusion breadth. Relapse of a corrected squint-amblyopia is also prevented. Fusion faculty and depth perception increase under the prisms so that the latter can be successively weakened and, in not a few cases, finally discarded altogether. It depends largely on whether or not the squint had been present for a long time before correction of refraction and use of prisms. Importance of the early use of glasses is obvious.

STUDIES OF OCULAR FATIGUE. DR. BERENS AND DR. STARKE, New York.

Tests with the methods of Ferrer, Lancaster and William, and above all with Howe's "Ergograph," were made showing the relation to normal and subnormal accommodation. It is possible by combined examination to differentiate between accommodative asthenopia and that caused by tiring of convergence.

SAFETY SUTURE IN MUSCLE OPERATIONS. DR. LINDSAY REA, London.

In tonotomies an untied suture should be carried around the tendon so that during the after-treatment over effect may be prevented by knotting.

DISCUSSION

DR. L. C. PETER, Philadelphia: The Marlow occlusion test advised by Barkan often aids materially in the detection of muscular asthenopia.

DR. A. BIELSCHOWSKY, Breslau, Germany: I agree in condemning simple tenotomy. Rea's safety suture of the tenotomized tendon was recommended by me as a safety thread almost thirty years ago. Exact determination of the fusion breadth will determine a heterophoria which escapes the usual tests, with about the same accuracy as occlusion which for a number of "extrinsic" reasons cannot be generally applied. The importance which American occulists attach to heterophoria as a cause of astheopia and general disturbances is probably due to the nervous imbalance of American patients and their neurotic disposition, as orthophoria is the exception in Europe. It is striking that in the cases of Barkan in which the patients were actually benefited by phoria correction, the degree of error was less than that noted in many patients without any symptoms. This suggests neurosis (P. H. F.?). Fusion training is of value in only a small percentage of these cases, and better results are obtained with prisms or—in higher degrees—operation.

DR. A. FUCHS, Vienna: I support Barkan's contentions. Within two months I have noted six cases of hyperphoria in which the condition was detected only after occlusion (Marlow) for twenty-four hours. The correction of the latent hyperphoria resulted in a most striking relief from all symptoms and complaints. That American patients are more easily to be had for these investigations and tests does not depend on any psychopathic disposition, but on the sharp power of observation of the Americans and their determination to give and to get the best.

HYDROGEN ION CONCENTRATION AND ALKALI RESERVE OF THE VITREOUS. DR. J. MAVAS, Paris.

The p_H of the vitreous is about that of the blood, i. e., +0.75. Total carbonic acid and alkali reserve range between 73 and 70 per cent. There is an acid equilibrium in the normal eye. In glaucoma, the p_H content varies from 6 to 7.3 (local, uncompensated acidosis, or asphyctic condition of the eye), hence the necessity of stimulating intra-ocular circulation by heat and counteracting the acidosis by suitable subconjunctival injections.

DISCUSSION

DR. REDSLOB, Strasbourg, France: Acidosis of the aqueous is an indication of nature's method, and shows an attempt on the part of the organism to produce a defense mechanism against the increase of tension. One should promote the acidosis rather than attempt to neutralize it. I have had excellent results, based on this theory, with the introduction of isotonic solutions of phosphoric acid into the vitreous in glaucoma.

DR. T. NÓNAY, Pecz, Hungary: I have found that epinephrine and a solution of pituitary injected subcutaneously or subconjunctivally, or merely instilled into the eye, could invariably be found later in the aqueous. The amounts are so small that chemical tests do not reveal

their presence. The biologic method alone does so. Dr. Rossi, Rome: Dr. Rossi claims priority (1823, sic. ? 1923) for the observation of epinephrine in the aqueous by the biologic method.

THE PROBLEM OF RESORPTION. DR. K. WESSELY, Munich.

As stated in 1904, the colloid-osmotic pressure of albuminoid bodies of the blood cannot be the only active factor in the resorption of crystalloid-isotonic fluids in the tissues. Studies of the conjunctiva with autoserum now confirm this view. The blood vessels must have special "idiophysic" (P. H. F.?) resorbent properties depending on the condition of the living cell wall, which, naturally can be increased or lowered, i. e., damaged by disease. This point of general physiology is of practical importance for our conception of normal as well as of pathologically increased intra-ocular tension.

DISCUSSION

DR. A. ELSCHNIG, Prague: Does the resorption of fluid injected subconjunctivally allow us to draw conclusions as to the facts of resorption of instilled drops? The latter, we know, act much more quickly when the conjunctiva has been made anemic than in normal or, particularly, in inflamed conjunctivae. Further, is there a relation between the intra-ocular action and the local (conjunctival) application of medicaments? Gnad's (Prague) observations show that the local action on the iris corresponds closely to the conjunctival site.

CLEARING OF CORNEAL OPACITIES WITH METHYL SALICYLATE. DR. SABATZKY, Oels, Austria.

The patients in ten cases of various degrees of opacity showed marked improvement visually. So far, no failure has been encountered. This harmless method can be warmly recommended.

DISCUSSION

DR. F. P. FISCHER, Leipzig: Spalteholtz originated the methods for making tissues transparent and also explained them. Methyl salicylate does not diffuse. If a deposit of oil is introduced into the transparent cornea, it may improve sight if it covers half the pupil, or it may make it worse if it covers the center of the cornea. In both cases it acts on account of its high refractive index as a sort of diaphragm.

TREATMENT OF ULCUS SERPENS BY HYPOTONY. DR. Z. BRUCKNER, Prague.

The method was suggested by the general improvement in such cases which follows spontaneous perforation and coincident lowering of tension. If this is brought about by posterior sclerotomy or by trephining the cornea in normal or immunized animals, the hemolysin content of the cornea is increased (twenty to thirty times in rabbits). Opening the vitreous or anterior chamber with a lancet and repeated "ventilation" of the operative incision with a spatula reduced hypopyon and improved

local conditions. In superficial ulcers, repeated puncture acts much like antiseptics with a depth action which the latter do not have, but it is more painful, objectionable to timid patients, and technically more difficult. In ulcers with deep infiltration of the corneal lamellae thermocautery is as reliable as puncture. In smaller ulcers with infiltration of from 1 to 6 mm., cure may result in 50 per cent without perforation.

DISCUSSION

DR. R. SONDERMANN, Freiburg, Germany: I gave up paracentesis in cases of severe corneal ulcers on account of unsatisfactory results and the annoyance to the patient of repeated operative procedures. I now trephine the ulcer. In sixty cases I have had excellent results. Almost invariably one can count on immediate cessation of the ulcerative process. This is of great practical importance, as the ulcers so often occupy the pupillary area of the cornea. Anterior synechia cannot always be prevented, just as with paracentesis or Saemisch section. The anterior chamber is not restored, as a rule, for several days but healing generally progresses smoothly without the need of any other measures.

DR. J. OHM, Bottrop, Germany: I treat patients with severe ulcus serpens by keratome incision at the limbus and paracentesis. In one desperate case, a small paracentesis was made, at the same spot, six days in succession. This case healed with good vision and no sign of operation. The purulent destruction of the cornea is always stopped, at once.

DR. V. REIS, Lemberg: I agree, and note that long before we knew anything about immunity, this procedure was in use at the clinic of Machek by a pupil of Arlt. In severe cases of ulcus serpens with much pain, puncture of the cornea at an appropriate point was always practiced and the wound opened several times a day and "ventilated" with a spatula for a while. The results were splendid.

DR. Z. BRUCKNER, Prague: I wish to clarify the principles underlying the relation between artificially induced hypotony and the clinical course of severe ulcus serpens. In desperate cases in which puncture cannot be counted on to prevent perforation, Sondermann's well known procedure of trephining the ulcer, or an artificial perforation, is justified.

IONTOPHORESIS OF MYDRIATICS IN IRITIS AND IRIDOCYCLITIS. DR. G. F. ROCHAT, Gröningen, Holland.

The introduction of medication into the interior of the eye by the galvanic current has had its most brilliant triumphs in the treatment for corneal ulcer. Research with mydriatics shows that while a 1: 10,000 solution of atrophine instilled causes only a late and incomplete dilatation of the pupil, a rapid maximal reaction is obtained with iontophorese and a solution 100 times weaker. Dense iritic adhesions which do not yield to strong solutions of atrophine as ordinarily instilled are easily broken by iontophoresis and a 1: 1,000 solution without danger of intoxication. To avoid pain and injury of the corneal epithelium, certain special precautions are advisable. The technic is described.

(To be continued)

Book Reviews

AFFECTIONS OF THE EYE IN GENERAL PRACTICE. By R. LINDSAY REA. Price, 10 shillings. Pp. 155, with 7 colored plates and 330 other illustrations. London, H. K. Lewis & Company, 1930.

To assist the general practitioner in the recognition and treatment of those diseases of the eye that patients are likely to present, as well as to indicate those diseases that should be referred to the specialist, is the purpose of this work. The subject is divided into the usual anatomic subdivisions, working from the lids backward. The more common diseases are briefly but adequately described, and the directions for treatment are clear and concise. A chapter is devoted to the examination of the eye in diseases of the nervous system, and another treats of the localizing value of symptoms in the eye in the diagnosis of disease of the brain. A chapter on the hygiene of the eye and a list of therapeutic formulae conclude the volume.

The amount of material to be included in a book of this kind naturally varies with the author's personal views. The selection seems to be an excellent one and no criticism can be made. The illustrations are adequate and the author is to be congratulated on the success of his undertaking.

A. K.

STEREOSKOPISCHER ATLAS DER AEUSSEREN ERKRANKUNGEN DES AUGES. by PROF. K. WESSELY. Part I. Munich, J. F. Bergmann, 1930.

The author, who has been interested in colored stereoscopic photography for many years, presents a new "Atlas of External Diseases." This atlas consists of stereoscopic pictures in true colors. The camera that was finally selected as best for this purpose was described by his associate, Dr. Zabel, at the Heidelberg Congress in 1927. The plates are Agfa color plates. The reproduction of these color photographs in three colors was painstaking and difficult, but the ultimate success cannot be questioned. The atlas is to appear in six parts, each part being made up of ten pictures. Typical examples of important diseases are selected, and on the reverse side of each photograph there is a short descriptive text in German; in French, by Dr. Kenel, of La Chaux-de-Fonds, and in English, by Dr. O. P. Perkins, of New York. The uses of this atlas are manifold, not only for instruction but for demonstration and teaching purposes. The great value of the pictures consists in their being absolutely true to nature. The subjects selected are: (1) pigmented nevus on lower lid; (2) circumscribed melanosis of conjunctiva; (3) recent lime burn; (4) congenital coloboma of the iris; (5) symblepharon of lower lid; (6) gonorrheal ophthalmia; (7) iris bombé; (8) sarcoma of orbit; (9) herpes zoster ophthalmicus; (10) advanced carcinoma of the lid.

The author is to be congratulated on a noteworthy addition to ophthalmic literature. The printers deserve great praise for their success in color reproduction.

A. K.

DISEASES OF THE EYE. By SIR JOHN HERBERT PARSONS. Sixth edition. Price, $5.50. Pp. 678, with 21 plates and 348 text figures. New York, The Macmillan Company, 1930.

A new edition is a necessary corollary of a deservedly popular textbook. In this edition the text has been revised, but as the book has always been kept up to date, no great changes had to be made; however, there have been some additions to the text and illustrations. The many excellent features of this book are so well known that they need not be repeated. The young ophthalmologist can find no better introduction to the scientific and clinical sides of his specialty, and it is a great satisfaction to note that in a comparatively small volume so much valuable information is available, beautifully illustrated and presented in a clear and scholarly style.

A. K.

Directory of Ophthalmologic and Otolaryngologic Societies *

FOREIGN

Oxford Ophthalmological Congress

Master: Dr. A. B. Cridland, Salisbury House, Chapel Ash, Wolverhampton, England.
Secretary: Dr. C. G. Russ-Wood, 12 St. John's Hill, Shrewsbury, England.
Place: Oxford. Time: July 10-12, 1930.

Deutsche Ophthalmologischen Gesellschaft

Secretary: Prof. A. Wagenmann.
Place: Heidelberg. Time: June 12-14, 1930.

NATIONAL

American Medical Association, Section on Ophthalmology

Chairman: Dr. T. B. Holloway, 1819 Chestnut St., Philadelphia.
Secretary: Dr. William C. Finnoff, Imperial Bldg., Denver.
Place: Detroit. Time: June 23-27, 1930.

American Academy of Ophthalmology and Oto-Laryngology

President: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
President-Elect: Dr. J. F. Barnhill, Miami Beach, Florida.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Chicago. Time: October 27-31, 1930.

American Ophthalmological Society

President: Dr. W. Campbell Posey, Radnor, Pa.
Secretary: Dr. Emory Hill, 501 E. Franklin St., Richmond, Va.
Place: Hot Springs, Va. Time: June 2-4, 1930.

SECTIONAL

New England Ophthalmological Society

President: Dr. S. Judd Beach, 704 Congress St., Portland, Maine.
Secretary-Treasurer: Dr. E. B. Dunphy, 520 Commonwealth Ave., Boston.
Place: Massachusetts Eye and Ear Infirmary, 243 Charles St., Boston. Time: 8 p. m., third Tuesday of each month from November to April, inclusive.

Pacific Coast Oto-Ophthalmological Society

President: Dr. Arthur Jones, 105 N. 8th St., Boise, Idaho.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.
Place: Victoria, B. C. Time: September 4-6, 1930.

Puget Sound Academy of Ophthalmology and Oto-Laryngology

President: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.
Secretary-Treasurer: Dr. Francis A. Brugman, Medical-Dental Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

Southern Medical Association, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Fred Hasty, 119 Seventh Ave., Nashville, Tenn.
Secretary: Dr. Fletcher D. Woodward, Box 162, University, Va.
Place: Louisville, Ky. Time: November, 1930.

Southwestern Michigan Triological Society

President: Dr. Wilfrid Haughey, 65 W. Michigan Ave., Battle Creek.
Secretary: Dr. R. H. Fraser, Battle Creek Sanitarium, Battle Creek.
Time: Third Thursday of alternate months.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

STATE

Colorado Ophthalmological Society

President: A presiding officer is selected for each meeting alternately until all members have served.
Secretary: Dr. Donald H. O'Rourke, 217 Imperial Bldg., Denver.
Place: First floor, Metropolitan Building, Denver. Time: 7:30 p. m., third Saturday of the month, October to April, inclusive.

Eye, Ear, Nose and Throat Club of Georgia

President: Dr. George B. Smith, Rome.
Secretary-Treasurer: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.

Indiana Academy of Ophthalmology and Oto-Laryngology

President: Dr. H. A. Van Osdol, 320 N. Meridian St., Indianapolis.
Secretary: Dr. Robert J. Masters, 23 E. Ohio St., Indianapolis.
Place: Indianapolis. Time: December 10 and 11, 1930.

Minnesota Academy of Ophthalmology and Oto-Laryngology

President: Dr. C. N. Spratt, 900 Nicollet Ave., Minneapolis.
Secretary-Treasurer: Dr. J. H. Morse, 80 S. 7th St., Minneapolis.

Montana Academy of Oto-Ophthalmology

President: Dr. Lee W. Smith, 125 W. Granite St., Butte.
Secretary: Dr. J. G. Parsons, Lewistown.

North Dakota Academy of Ophthalmology and Otolaryngology

President: Dr. George M. Constans, Bismarck.
Secretary-Treasurer: Dr. F. L. Wicks, Valley City.

Oregon Academy of Ophthalmology and Oto-Laryngology

President: Dr. J. W. McCollom, 346½ Washington St., Portland.
Secretary-Treasurer: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

Rhode Island Ophthalmological and Otological Society

President: Dr. J. E. Raia, 276 Broadway, Providence, R. I.
Secretary: Dr. F. W. Dimmitt, 195 Thayer St., Providence, R. I.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

Utah Ophthalmological Society

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. H. Leroy Smith, Ezra Thompson Bldg., Salt Lake City.

Virginia Society of Oto-Laryngology and Ophthalmology

President: Dr. Fletcher D. Woodward, Box 162, University.
Secretary-Treasurer: Dr. Henry Grant Preston, Harrisonburg.

LOCAL

Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Frederick J. Wort, 1080 Broad St., Newark.
Secretary: Dr. Earl LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

Academy of Medicine of Toronto, Section of Ophthalmology

Chairman: Dr. Louis Joseph Sebert, 86 Bloor St., W., Toronto.
Secretary: Dr. Alexander E. MacDonald, 151 Bloor St., W., Toronto.
Time: First Monday of winter months.

Atlanta Academy of Ophthalmology and Oto-Laryngology

President: Dr. William L. McDougall, Atlantic National Bank Bldg., Atlanta, Ga.
Secretary: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

Baltimore Medical Society, Section on Ophthalmology

Chairman: Dr. Leo J. Goldbach, 1012 N. Charles St., Baltimore.
Secretary: Dr. Angus Lloyd MacLean, Johns Hopkins Hospital, Baltimore.
Place: Medical and Chirurgical Faculty, 1211 Cathedral St. Time: 8:30 p. m., fourth Thursday of each month from October to May.

Brooklyn Ophthalmological Society

President: Dr. John N. Evans, 23 Schermerhorn St., Brooklyn.
Secretary: Dr. Michael J. Buonaguro, 589 Lorimer St., Brooklyn.
Place: Kings County Medical Society Bldg., 1313 Bedford Ave. Time: Third Thursday of February, April, May, October and December.

Buffalo Ophthalmologic Club

President: Dr. A. F. Luhr, 40 W. North Ave., Buffalo.
Secretary-Treasurer: Dr. Thurber Lewin, 112 Linwood Ave., Buffalo.

Chicago Ophthalmological Society

President: Dr. Charles G. Darling, 30 N. Michigan Ave., Chicago.
Secretary: Dr. Richard C. Gamble, 30 N. Michigan Ave., Chicago.
Place: Medical and Dental Arts Club. Time: Third Monday from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Oto-Laryngology

Chairman: Dr. M. Paul Motto, Rose Bldg., Cleveland.
Secretary: Dr. A. D. Ruedemans, Euclid and E. 93d St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

Cleveland Ophthalmological Club

Chairman: Dr. W. E. Bruner, Guardian Bldg., Cleveland.
Secretary: Dr. M. P. Motto, Rose Bldg., Cleveland.

College of Physicians, Philadelphia, Section on Ophthalmology

Chairman: Dr. Maxwell Langdon, 1530 Locust St., Philadelphia.
Clerk: Dr. Alexander G. Fewell, 1924 Pine St., Philadelphia.
Time: Third Thursday of every month from October to April, inclusive.

Columbus Ophthalmological and Otolaryngological Society

Chairman: Dr. John E. Brown, 370 E. Town St., Columbus, Ohio.
Secretary-Treasurer: Dr. Albert D. Frost, 681 E. Broad St., Columbus, Ohio.
Time: First Monday of each month.

Dallas Academy of Ophthalmology and Oto-Laryngology

President: Dr. D. L. Bettison, Medical Arts Bldg., Dallas, Texas.
Executive Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas, Texas.
Recording Secretary: Dr. L. A. Nelson, 4105 Live Oak, Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Detroit Ophthalmological Club

Chairman: Members rotate alphabetically.
Secretary: Dr. Parker Heath, David Whitney Bldg., Detroit.
Time: 6:30 p. m., first Wednesday of each month.

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. John P. O'Keefe, 251 State St., Albany.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. W. R. Thompson, 510 Main St., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, Fort Worth National Bank Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. Claude C. Cody, 1306 Walker Ave., Houston, Texas.
Secretary: Dr. J. M. Robison, Eye, Ear, Nose and Throat Hospital, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. Robert J. Masters, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. A. E. Eubank, Argyle Bldg., Kansas City, Mo.
Secretary: Dr. O. S. Gilliland, Professional Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

Long Beach Eye, Ear, Nose and Throat Society

President: Dr. W. B. Wright, Jr., 1209 Pine Ave., Long Beach, Calif.
Secretary-Treasurer: Dr. M. A. Schurter, 114 E. 7th St., Long Beach, Calif.
Place: Pacific Coast Club. Time: Last Wednesday of each month from September to June.

Los Angeles County Medical Society, Section on Ophthalmology and Otolaryngology

President: Dr. A. Ray Irvine, 727 W. 7th St., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 727 W. 7th St., Los Angeles.
Place: California Lutheran Hospital, Assembly Room. Time: 8 p. m., first Monday of each month.

Medical Society of the District of Columbia, Section of Ophthalmology and Oto-Laryngology

Chairman: Dr. Louis S. Greene, 1710 Rhode Island Ave. N. W., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

Milwaukee Oto-Ophthalmic Society

President: Dr. Edward R. Ryan, 425 E. Water St., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 120 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Chairman: Dr. R. J. Warner, 706 Church St., Nashville, Tenn.
Secretary-Treasurer: Dr. W. W. Wilkerson, Jr., Bennie-Dillon Bldg., Nashville, Tenn.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

NEW ORLEANS OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. W. A. Wagner, Pere Marquette Bldg., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: Third Thursday of each month from October to June.

NEW YORK ACADEMY OF MEDICINE, SECTION OF OPHTHALMOLOGY

Chairman: Dr. E. F. Krug, 12 W. 44th St., New York.
Secretary: Dr. William F. C. Steinbugler, 815 Park Ave., New York.
Time: 8:30 p. m., third Monday of every month from October to May, inclusive.

OMAHA AND COUNCIL BLUFFS OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SOCIETY

President: Dr. Charles M. Swab, Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. C. Davis, 1615 Howard St., Omaha.
Place: Medical Tea Room. Time: 5:15 and 7:00 p. m., third Wednesday of each month from October to May.

PITTSBURGH OPHTHALMOLOGICAL SOCIETY

President: Dr. Edward B. Heckel, Jenkins Arcade Bldg., Pittsburgh.
Secretary: Dr. George H. Shuman, Park Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine Bldg. Time: Fourth Monday of each month, except June, July, August and September.

PITTSBURGH SLIT-LAMP SOCIETY

President: Dr. W. W. Blair, 121 University Pl., Pittsburgh.
Secretary: Dr. George H. Shuman, Park Bldg., Pittsburgh.
Place: 121 University Pl. Time: Second Monday evening of every month, except June, July, August and September.

ROCHESTER EYE, EAR, NOSE AND THROAT SOCIETY

Chairman: Dr. A. Vincent Walker, 833 South Ave., Rochester, N. Y.
Secretary-Treasurer: Dr. John F. Gipner, 53 Fitzhugh St., Rochester, N. Y.
Place: Rochester Medical Assn., 113 Prince St. Time: 8 p. m., third Monday of each month from October to May.

ST. LOUIS OPHTHALMIC SOCIETY

President: Dr. Charles W. Tooker, 308 N. 6th St., St. Louis.
Secretary: Dr. Carl T. Eber, 1006 Carleton Bldg., St. Louis.
Place: St. Louis or Washington University Cafeteria.
Time: 6:30 p. m., fourth Friday of each month from October to April, inclusive.

SAN ANTONIO OPHTHALMOLO-OTO-LARYNGOLOGICAL SOCIETY

President: Dr. F. W. Sorrell, Gibbs Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. A. F. Clark, 728 Main Ave., San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

SPOKANE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. A. N. Codd, 421 W. Riverside Ave., Spokane, Wash.
Secretary: Dr. Marc Anthony, Old National Bank Bldg., Spokane, Wash.

SYRACUSE EYE, EAR, NOSE AND THROAT SOCIETY

President: Dr. Searle B. Marlow, State Tower Bldg., Syracuse, N. Y.
Secretary-Treasurer: Dr. A. Harry Rubenstein, Medical Arts Bldg., Syracuse, N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.

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